

CRANFIELD UNIVERSITY

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A Systematic Review of
The Determinants and the Behaviour of Equity Risk Premium

School of Management
MRes Dissertation

Master of Research in Management Research

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Academic Year: 2012 - 2013

Supervisor: Prof. Sunil Poshakwale
August 2013

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Abstract

Understanding the Equity Risk Premium (ERP) and the factors affecting it is cardinal to financial economics, particularly to equity research analysts, domestic and international institutional investors and financial economist. Since the seminal work of Mehra and Prescott (1985) there has been an exponential rise in the research explaining the reasons for ERP puzzle.

This review, systematically, investigates the literature related to ERP in four key dimensions. The first dimension is regarding the issues related to different techniques of estimating the ERP. The second dimension is regarding the studies that explain the reasons of existence of the ERP puzzle by making modifications to the preference structures. The third is regarding the macroeconomic variables that help in predicting ERP and the fourth deals with studies that are conducted in the international context.

In addition to this, this review meticulously captures some important limitations of the existing literature regarding the estimation of ERP and identifies the domestic and international determinants of ERP, in particular the UK ERP and proposes novel future directions of research. These future research directions have two important implications for my PhD. The first is the academic contribution that predominantly comes from methodological contribution of estimating the ERP. The second is the practical contribution that comes mainly from identifying the unique set of variables (UK domestic and international), which are of prime importance to the domestic and foreign institutional investors because of the financial crisis of 2008-2009 and which should affect the UK ERP.

Keywords:

Equity premium, equity premium puzzle, habit formation, rare disasters, behavioural finance, macroeconomic factors

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List of Abbreviations

ERP	Equity Risk Premium
OEIC	Open Ended Investment Company
CAPM	Capital Asset Pricing Model
CCAPM	Consumption Capital Asset Pricing Model
RRA	Relative Risk Aversion
CRRA	Constant Relative Risk Aversion
AR	Autoregressive
ARCH	Autoregressive Conditional Heteroskedasticity
GARCH	Generalised Autoregressive Conditional Heteroskedasticity
ARIMA	Autoregressive Integrated Moving Average
MA	Moving Average
VAR	Vector Auto regression
S&P	Standard and Poor's
FTSE	Financial Times Stock Exchange
MSCI	Morgan Stanley Capital Index
ROE	Return of Equity
GDP	Gross Domestic Product
OECD	Organisation for Economic Co-operation and Development
LA	Loss Aversion
DA	Disappointment Aversion
GDA	Generalised Disappointment Aversion
SDF	Stochastic Discount Factor
BBA	British Banker's Association
MRS	Marginal Rate of Substitution
IMRS	Intertemporal Marginal Rate of Substitution
GMM	Generalised Method of Moment
BMP	Bond Maturity Premium
OOS	Out of Sample
EAFE	Europe, Australasia and Far East
USD	United States Dollar
TED	Treasury- Eurodollar

1 Introduction

Both intuition and economic theory suggest that risk and returns of any asset should be positively correlated with to each other. As equities are traditionally considered to be riskier than government bonds (risk-free security) they should earn higher returns than government bonds i.e. investors should receive a premium to take extra risk of investing in equities over bond. The excess return over a risk-free government security is known as Equity Risk Premium (ERP). It is most widely used to estimate cost of capital which is required in evaluating investment opportunities. It is also a major input used by Equity Research Analysts in the Discounted Cash-flow Valuation in forecasting the equity prices. ERP is an important parameter in asset allocation decisions for fund managers of Pension Funds, Mutual Funds, OEICs, Unit Trusts, Exchange Traded Funds, and Hedge Funds. ERP helps Foreign Institutional Investors to take portfolio investment decisions in any economy. As such the importance of ERP and the factors affecting it cannot be neglected.

Following the financial crisis of 2008-2009 and the on-going European Debt crisis, researches and practitioners are particularly interested in understanding how and why a particular economic shock originating in one economy transmits to the other economy and how and why it affects the domestic fundamentals of the other economy thereby disrupting the normal behaviour of the asset markets and in particular risk premiums. The UK, for example, is an “international” economy and therefore the risk premiums and the asset market behaviour in the UK should not only be analysed by the domestic macroeconomic factors but also by international factors. 70% of the revenue of the companies in the FTSE 100 comes from outside UK[(Schäfer 2013; Haigh 2011)]. Clearly any disruptions in the asset markets and in macroeconomic factors abroad should have impact on the ERP in the UK.

Against this backdrop, the aim of this review is to:

- 1) Identify the domestic and international macroeconomic factors that affect equity risk premium.
- 2) To understand the predictive ability of these factors to explain ERP and whether the factors have changed over time.
- 3) To understand the time varying nature of ERP.

- 4) To understand and explore various explanations, proposed in the literature, for the ERP puzzle.

To address the aforementioned objectives and drawing upon the broad literature in my scoping study review I intend to answer following review question:

What, according to the literature, are the key determinants of equity risk premium and whether equity risk premium has changed over time?

The above overarching question leads to following sub-questions:

- 1) How, according to the literature, ERP is estimated?
- 2) What is the impact of macroeconomic factors on ERP?
- 3) What is the impact of international macroeconomic factors on ERP?
- 4) What does the literature suggests about possible reasons of the ERP puzzle?

The reason for the fourth sub-question was that I realised that in order to thoroughly understand the underlying theoretical framework for ERP, one has to understand the economic link between risk aversion, macroeconomic factors and the behaviour of financial market data vis-à-vis ERP (in my context).

1.1 Positioning the Field of Enquiry

Here I provide the overview of the literature domains that are most relevant to the review question and the overarching questions. These are ERP Puzzle and their explanations, Estimation of ERP, International studies on ERP and effect of Macroeconomic factors on ERP. Figure 1 shows these literature domains.

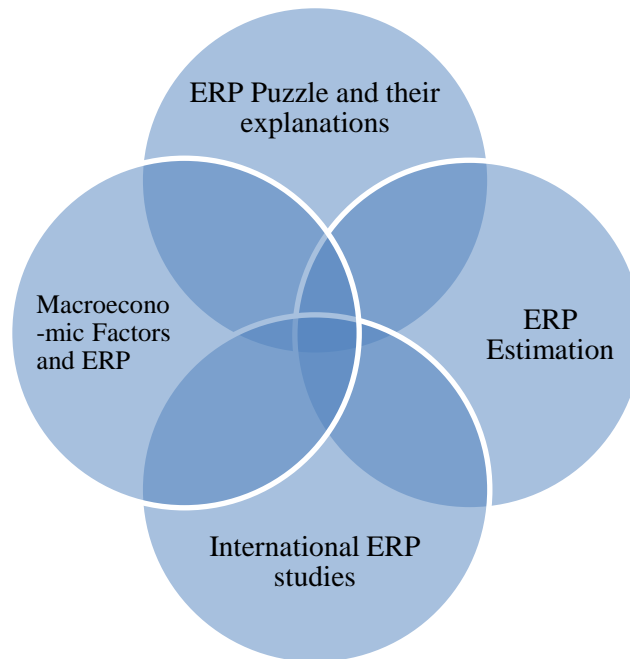


Figure 1: Literature Domains

- 1) **ERP Puzzle and their Explanations:** This domain mainly deals with the studies related asset pricing puzzles, especially the ERP puzzle. This is an important domain because the ERP puzzle has stimulated a huge amount of literature on ERP which explains why ERP exists by modifying the existing models that give rise to the puzzle.
- 2) **ERP Estimation:** It is essential to have an accurate estimate of ERP as it has both theoretical as well as practical implications. This body of literature covers the studies of ex-ante, ex post, conditional and unconditional measures of ERP and the various advantages and drawbacks of using a particular method/technique for estimating the ERP.
- 3) **International ERP Studies:** The studies in this domain mainly deal with the size of ERP across the international markets. These studies basically try to overcome the survivorship bias.
- 4) **Macroeconomic Factors and ERP:** The studies in this domain mainly use econometric analysis to establish relationship between ERP and domestic macroeconomic factors.

By taking into consideration the studies in these four literature domains, it is possible to get an overview of the factors that affect ERP. In addition to this it is also possible to review whether ERP is time-varying or not.

The rest of the review is structured in the following way. Section 2 gives the theoretical background of the review and discusses the seminal work of Mehra and Prescott (1985) and basic concepts of Consumption Capital Asset Pricing Model that stimulated research related to ERP. Section 3 outlines the methodology of this review i.e. how the review was conducted. Section 4 gives the descriptive account of the literature. In Section 5 I present the thematic findings of the articles reviewed. In section 6 I discuss the limitation of the existing literature and propose future research directions for my PhD. Section 7 concludes

2 Theoretical Background

In this section I will illustrate the theoretical foundation that led to an exponential growth in the literature related to ERP. Essentially this foundation is based on the combination of concepts in Consumption Capital Asset Pricing Model (CCAPM) and Expected Utility Hypothesis. In my Scoping Study Review, I had discussed various asset pricing models along with some elements of expected utility theory and the economic significance of various utility functions. Here I will discuss, in brief, the CCAPM and the ERP puzzle, which is basically the point of origin of the ERP literature.

Consumption Capital Asset Pricing Model (CCAPM) basically consists of combination of concepts from Consumer Choice Theory, Expected Utility Theory and intertemporal choices made by the investor. This model [Breedon (1979), Rubinstein (1976), Shiller (1982), and Cochrane (2001)] suggests that an investor faces an inter-temporal choice wherein he/she can choose not to consume today (C_t) and save and use the proceeds to buy an asset at price P_t today which has a total payoff of x_{t+1} in time $t+1$ and use it to consume C_{t+1} in the future. In such a scenario the investor would like to maximise his utility of consumption in the next period. Thus the investor faces following situation:

$$\max U(c_t) + E[U(c_{t+1})] \text{ subject to}$$

$$c_t = e_t - \theta \cdot p_t$$

$$c_{t+1} = e_{t+1} + \theta \cdot x_{t+1}$$

where e_t is the original level of consumption and θ is the amount of asset the investors buys. The first order condition of above situation is:

$$p_t \cdot U'(c_t) = E[\beta \cdot U'(c_{t+1}) \cdot x_{t+1}] \text{ ----- } -1$$

Equation 1 is basic pricing equation of any asset under risk and basically suggests that the loss in marginal utility $\{p_t \cdot U'(c_t)\}$ of not consuming today and saving it and using it to buy an asset at price P_t must be same as the expected gain in the marginal utility of consumption because of the payoff x_{t+1} $\{E[\beta \cdot U'(c_{t+1}) \cdot x_{t+1}]\}$ in the future,

discounted by investor's impatience β , i.e. the subjective discount factor. Equation 1 can be written as:

$$P_t = E_t \left[\beta \cdot \frac{U'(C_{t+1})}{U'(C_t)} \cdot x_{t+1} \right]$$

$$P_t = E_t[m_{t+1} \cdot x_{t+1}] \quad \text{-----2}$$

where $m_{t+1} \equiv \beta \cdot \left[\frac{U'(C_{t+1})}{U'(C_t)} \right]$ is marginal rate of substitution or the pricing kernel or the discount factor and captures the investors preference to substitute C_{t+1} for C_t . Equation 2 is also the basic asset pricing equation. This suggests that consumers evaluate the price of an asset by discounting the future stream of uncertain cashflows coming from that asset using their marginal rates of substitution as discount factor which is a function of risk aversion and time. Consumption CAPM is similar to traditional CAPM, in the sense the risk is captured by single β factor (not to be confused with the one in equation (1), however the difference is that in CCAPM the β is not measured with respect to market portfolio but it captures the risk of intertemporal substitution of consumption whereas in traditional CAPM the β of the security is measured by the covariance of the return of a security with the market portfolio.

For a risky asset with expected return R_e equation 1 and 2 implies

$$\beta \cdot E_t \left[\frac{U'(C_{t+1})}{U'(C_t)} \cdot R_{e,t+1} \right] = 1 \quad \text{--- (3)}$$

And the risk-free return R_f is given by

$$\beta \cdot E_t \left[\frac{U'(C_{t+1})}{U'(C_t)} \cdot R_{f,t+1} \right] = 1$$

Equation 3 can be shown to be:

$$E_t(R_{e,t+1}) = R_{f,t+1} + Cov \left(-\frac{U'(C_{t+1})}{E(U'(C_t))}, R_{e,t+1} \right)$$

Now, Mehra and Prescott (1985) employed Lucas (1978) pure exchange economy wherein a representative agent follows the consumption path given by

$$E \left[\sum_{t=0}^{\infty} \beta^t U(c_t) \right], 0 < \beta < 1$$

They used a Constant Relative Risk Aversion (CRRA) class power utility function given by

$$U(c, \alpha) = \frac{C^{1-\alpha} - 1}{1 - \alpha}$$

$$\Rightarrow \lim_{\alpha \rightarrow 1} U(c, \alpha) = \ln(c, \alpha)$$

where $U(\cdot)$ is the utility function and α is the curvature of the utility function which is the coefficient of risk aversion. The dividend growth rate $G_d = x_{t+1}/x_t$ and the consumption growth rate $R_c = C_{t+1}/C_t$ were assumed to follow lognormal distribution.

Therefore equation 3 can be written as

$$E_t(R_{e,t+1}) = \frac{E_t(G_{d,t+1})}{\beta \cdot E_t(G_{d,t+1} \cdot R_{c,t+1}^{-\alpha})} \text{-----4}$$

$$E_t(R_{f,t+1}) = \frac{1}{\beta} \cdot \frac{1}{E_t(R_{c,t+1}^{-\alpha})} \text{-----5}$$

Now because the dividend growth process and consumption growth processes are jointly log normally distributed, equations 4 and 5 can be written in log forms as

$$\ln[E_t(R_{e,t+1})] = -\ln\beta + \alpha \cdot \mu_c - \frac{1}{2} \cdot \alpha^2 \cdot \alpha_c^2 + \alpha \cdot \sigma_{c,g} \text{-----6}$$

And

$$\ln[R_f] = -\ln\beta + \alpha \cdot \mu_c - \frac{1}{2} \cdot \alpha^2 \cdot \alpha_c^2 \text{-----7}$$

where $\mu_c = E[\ln R_c]$, $\sigma_{R_c}^2 = \text{Var}(\ln(R_c))$ and $\sigma_{c,g} = \text{cov}(\ln R_c, \ln G_d)$. Equations 6 minus 7 give log of ERP

$$\ln ERP = \ln(R_e) - \ln(R_f) = \alpha \cdot \text{cov}(\ln R_c, \ln G_d) \text{-----8}$$

Equation 8 also means

$$\ln ERP = \ln(R_e) - \ln(R_f) = \alpha \cdot \text{cov}(\ln R_c, \ln R_e) - - - - - 9$$

Equation 9 implies that log of ERP is the product of the coefficient of CRRA and the covariance between the continuously compounded growth rate in consumption and equity (risky) return. Now if one assumes that in equilibrium the continuously compounded growth rate in consumption approaches to that of dividend then equation 9 reduces to

$$\ln ERP = \ln(R_e) - \ln(R_f) = \alpha \cdot \sigma_{R_c}^2 - - - - 10$$

Equation 10 implies that log of ERP is the product of coefficient of RRA and variance of consumption growth rate. (Mehra 2003)

Mehra and Prescott (1985) reported following empirical facts for the US economy for the period 1889-1978

Table 1: Empirical Facts of US Economy

	Risk Free Rate	Return on S&P 500 index	ERP	Consumption Growth Rate
Mean	0.8%	6.98%	6.18%	1.8%
Standard Deviation	5.67%	16.54	16.67%	3.6%

Source: Mehra and Prescott (1985)

The actual value of US ERP was 6.18% which is far more than the value that is implied by standard economic theories of asset pricing. The risk free rate in Table 1 was the nominal yields on 3-month T-bills (for the period 1931-1978), Treasury Certificate (for period of 1920-1930) and sixty and ninety-day Prime Commercial Paper (prior to 1920). In order to get ERP of 6.18 % the coefficient of risk aversion (α) should be around 47.68 in equation 10, which is implausible based on Arrow (1971), Friend and Blume (1975) and Kydland and Prescott (1982) as these studies imply that $\alpha \leq 5$. Hence investors in the US equity markets have to be extremely risk averse. The consumption growth rate in the US is not volatile enough to generate ERP of 6.18%. This is the ERP puzzle.

As mentioned earlier, this “puzzle” is the origin of the entire literature concerning ERP. There has been a plethora of literature that has emerged not just to explain the ERP puzzle but also to explain and identify the macroeconomic factors that affect ERP and various techniques of estimation of ERP. This study reviews the literature and presents the detailed findings in the thematic findings section. I have broadly classified this literature in four themes namely;

- 1) Estimation Techniques of ERP
- 2) Explanation of ERP puzzle
- 3) Macroeconomic Factors affecting ERP
- 4) International macroeconomic factors affecting ERP.

3 Methodology

This section describes how the review was conducted. The idea of systematic review stems from medical sciences wherein the emphasis is on evidence-based knowledge. The process is quite methodical and helps the reviewer to leave an audit trail so that the best informed decision is taken about planning the review, gathering the relevant articles, and reporting and dissemination of the findings. Tranfield et al.(2003). Broadly speaking, the review was conducted in three stages which were further sub-categorised into nine phases as shown in Table 2.

Table 2: Phases of the review ((Source Tranfield et al 2003)

Stage 1: Planning the review	Phase 0:	Identification for the need for review. (Section 1)
	Phase 1	Preparation of a proposal for the review. (Section 1 and 2)
	Phase 2	Development of review protocol. (Section 3)
Stage 2: Conducting the Review	Phase 3	Identification of research. (Section 1 and 2)
	Phase 4	Selection of studies. (Section 3.2 and 3.3)
	Phase 5	Study quality assessment. (Section 3.3.2 and Appendix B)
	Phase 6	Data extraction. (Section 3.4 and Appendix C)
	Phase 7	Data synthesis. (Section 5 and Appendix C)
Stage 3: Reporting and dissemination	Phase 8	The report and recommendations (Section 5 and 6)
	Phase 9	Getting evidence into practice. (Section 6)

3.1 The Consultation Panel

In order for me to conduct the systematic review systematically and to contribute to its validity and quality, I draw on a panel consisting of subject matter experts, methodology expert and an information specialist. The panel helped me, based on their expertise and experience, in specific areas of the review and guided me to develop the inclusion, exclusion and quality criteria (Tranfield et al 2003, p. 214). Table 3 gives the panel members and their role.

Table 3: Panel Members

Individual	Designation/Organisation	Role
Prof.Sunil Poshakwale	Professor of International Finance, Director of MSc in Finance and Management, Director of Centre for Research in Economics and Finance, Cranfield University School of Management	Supervisor: Providing literature recommendation and feedback on the review draft
Dr. Yacine Belghitar	Senior Lecturer in Finance, Cranfield University School of Management	Topic Advisor: Providing literature recommendation
Dr.Marek Szejczewski	Reader in Operations Management	Chair at the Scoping Study Panel. Providing guidance in methodology.
Ms Mary Betts-Gray	Business Information Specialist, Management Information Resource Centre, Cranfield University	Literature Search Advisor: Providing support for the search strategy

3.2 Search Strategy

In an effort to produce a systematic and detailed review, I employed a logical search strategy that best answered the review question. Figure 2 shows this logical search strategy. Keywords were identified by breaking the review question into implicit and explicit components. Search strings were generated using these keywords. The search strings were tested on the databases and search engines. If the search strings generate relevant search then they were tested for relevant or irrelevant articles. If the search string produced both relevant and irrelevant articles, then the irrelevant articles were filtered by modifying the search strings by including operators such as “NOT”. After filtering the irrelevant articles, the relevant articles were screened on the basis of titles and abstract as outlined in table 8. This refers to my preliminary search. After a particular paper is selected on the basis of the aforementioned preliminary search, the selection criteria for reading the entire paper are outlined in table 9. After reading the entire paper, it is taken further for the quality assessment based on the quality criteria (cf. table 10). Thus, a paper which went to quality assessment stage also incorporates the selection criteria of tables 8 and 9.

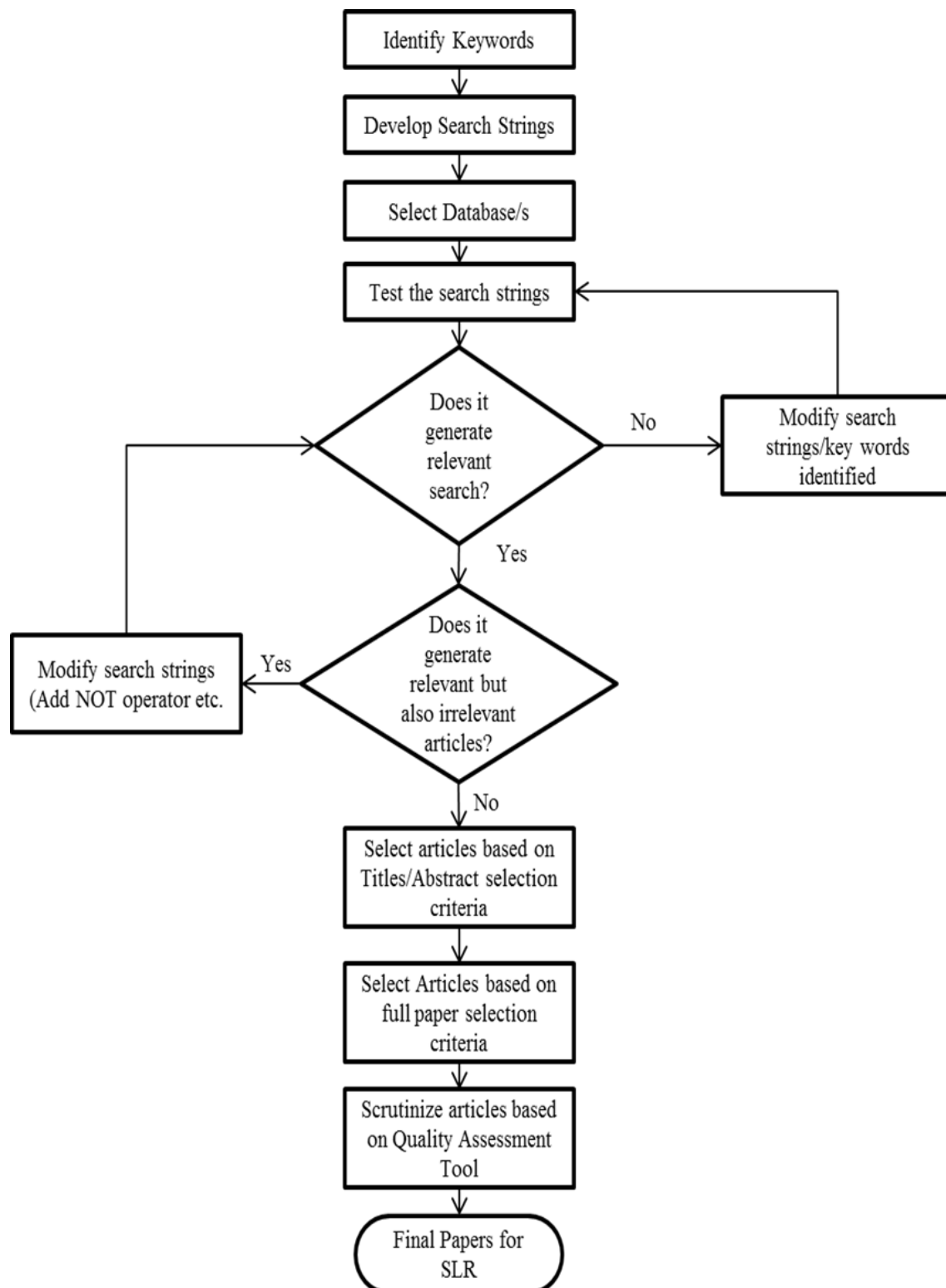


Figure 2: Search Process

3.2.1 Keywords

My review question has explicit and implicit components. Implicitly the review question looks for models of equity premium that fits the actual data. The novel feature of this approach is that it helps not only to identify such models or modification to the existing models but also identifies the factors that causes or affects equity premium. In doing so it addresses the explicit component of the review question and also discusses the time-varying aspect of equity premium. Figure 3 shows the components of the review question.

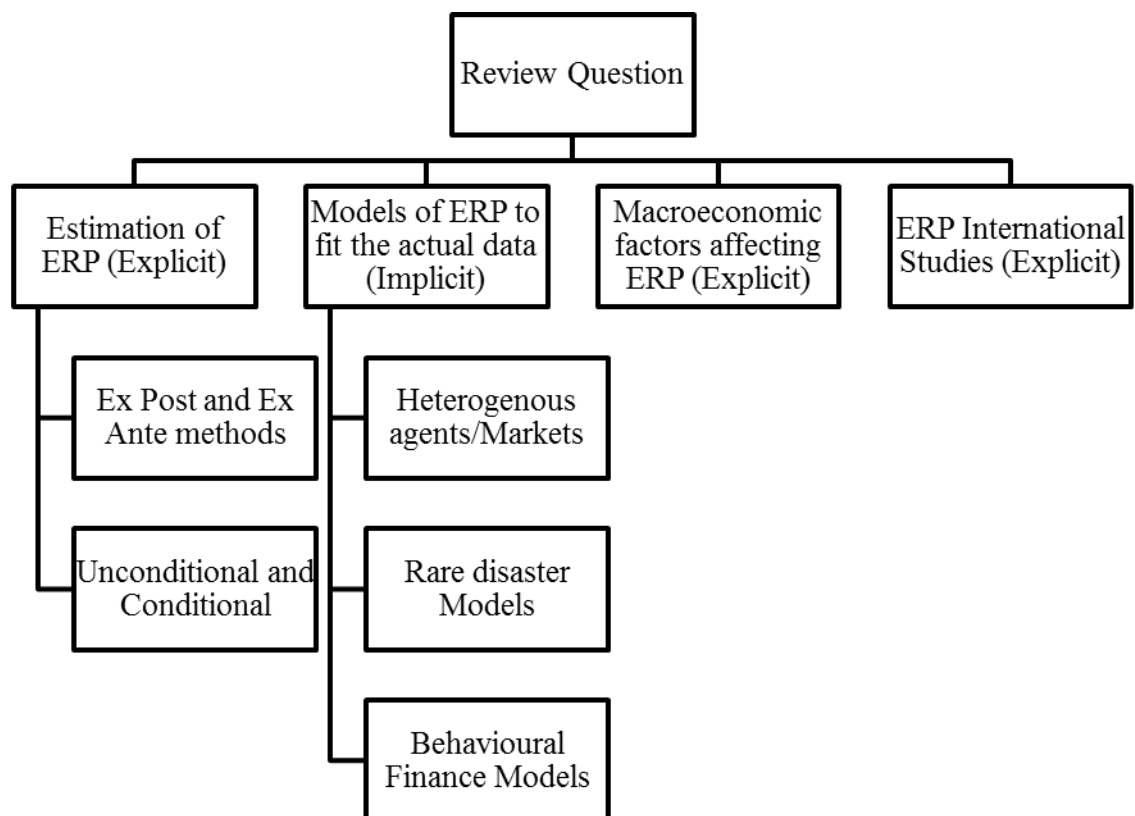


Figure 3: Components of Review Question

Table 4 gives the keywords to the components of the review question

Table 4: Keywords

Component No.	Component of the review question	Keywords
1	Estimation of ERP	Estimation, conditional estimation, unconditional estimation, dividend yield, earnings growth, price-dividend ratio, price-earnings ratio
2	Models of ERP to fit the actual data	Rare disasters, crash states, preferences, myopic loss aversion, heterogeneous markets, heterogeneous agents, incomplete markets.
3	Macroeconomic Factors affecting ERP	Macroeconomic Determinants, macroeconomic factors
4	International Macroeconomic Factors affecting ERP	International Macroeconomic factors/determinants, globalisation and ERP

In case my keywords were not able to detect the relevant studies for the review, cross-referencing will help me to find them as I find cross-referencing as an important powerful and effective tool of searching articles. In addition to this I have found two review articles which give a broad coverage of ERP literature up until 2005. One of them is published in 4* journal and the other in 2*, based on Cranfield School of Management Journal Recommendations for academic publication (2012). The keywords have been identified both from the components of the review question as well as articles which I have been reviewing during my research methods training. For example the keywords associated with the component “Models of ERP to fit the actual data” came from above-mentioned literature review article and which explained why ERP exists by considering different macroeconomic factors in different model settings such as modifying the preference structures in the utility-based models to explain ERP.

3.2.2 Search Strings

From the components of the review question and the keywords, I developed and tested search strings which are given in table 5

Table 5: Search Strings

No.	String	Rational
1	ALL("equity premium") AND ALL(("macroeconomic factor*" OR "macroeconomic determinant*" OR "international macroeconomic factor*" OR "globali*"))	Helps to search articles related to the third and fourth components of the review question
2	ALL("equity premium") AND ALL(("crash states" OR "disaster states" OR "rare disasters")) AND ALL(("crash events" OR "disaster events"))	Helps to search articles related to the second component of the review question
3	all("equity premium") AND all(("heterogeneous market" OR "heterogeneous agents" OR "Myopic Loss Aversion" OR "Incomplete Markets"))	Helps to search articles related to the second component of the review question
4	all("equity premium") AND all("time varyi*")	Helps to search articles related to time variation in ERP
5	all("equity premium") AND all(("estimation" OR "estimating"))	Helps to search articles related to the first component of the review question

3.2.3 Databases

The databases that I used for the searching the relevant articles are:

1. **ABI/Inform Global:** It is one of the largest data sources for articles in business, management and social science consisting of ProQuest Business Collection, ABI/Inform Dateline, ABI/Inform Trade and industry, Accounting and Tax, Banking Information and Sources, International Bibliography of Social Sciences, ProQuest Asian Business and Reference and ProQuest Entrepreneurship.
2. **EBSCO Business Source:** This is one of the most comprehensive databases for articles in business. It consist of following databases, which I will include in my search:
 - a. Business Source Complete
 - b. E-Journals
 - c. eBook Collection (EBSCO Host)
 - d. Environment Complete
 - e. ERIC
 - f. GreenFILE
 - g. Library, Information Science and Technology
 - h. MEDLINE
 - i. PsychINFO
3. **SciVerse Scopus:** This database is, especially, very comprehensive for articles in finance and economics.

The above three databases are appropriate for searching the articles related to equity risk premium.

3.2.4 Cross-Referencing

As mentioned earlier I consider cross-referencing a very powerful tool, especially in a matured area of research such as that of mine. I consider this technique to be very efficient and much more focussed as it enables a researcher to find the right articles for the research. The literature identified through this mechanism went through the same inclusion/exclusion criteria and quality assessment process that is developed for the articles that are searched from databases

3.3 Selection Criteria

The above-mentioned search technique resulted in large number of relevant and irrelevant articles as this is much matured area of research. As such the selection criteria had to be stringent so as to get manageable number of articles that addressed my review question. The overall selection criteria that were applied in the database during testing of the search strings are given in table 6. These criteria are present in the search engine as filtering criteria (in the form of tick boxes) and were applied after the getting initial hits using the search strings i.e. while testing the search strings as shown in figure 2

Table 6: Overall Selection Criteria

Criterion	Inclusion	Exclusion	Rationale
Relevance for the review question	Should be relevant	Irrelevant	Addresses the review question
Date of Publication	After 1985	Before 1985	Most of the modern literature on ERP that is relevant to my research has evolved since 1985
Language	English	Non-English	Almost entire research in Financial Economics is done in English language
Scientific Field	Economics, Econometrics, Finance, Financial Economics, Financial Markets	Decision Sciences, Engineering, Environmental Science, etc. and anything that is not in the inclusion criteria	Related to review question
Types of Publication	Academic, practitioner	News articles, theses, conference proceedings	To get the both academic and practitioner's perspective.

Panel A of table 7 gives the initial search string results and Panel B gives the result after applying the overall selection criteria of table 6

Table 7: Search String Results per database

Panel A					
Sr. No.	String No.	ABI	EBSCO	Scopus	Total
1	String 1	24	71	250	345
2	String 2	15	34	125	174
3	String 3	66	199	268	533
4	String 4	16	49	146	211
5	String 5	145	70	533	748
6	Total	266	423	1322	2011
Panel B					
Sr. No.	String No.	ABI	EBSCO	Scopus	Total
1	String 1	12	38	117	167
2	String 2	7	26	87	120
3	String 3	33	67	127	227
4	String 4	12	35	72	119
5	String 5	76	36	187	299
6	Total	140	202	590	932

Out of the total 932 articles, 389 were found to duplicate by exporting them in Mendeley software. So in total 543 articles were screened for further selection based on titles and abstracts.

Table 8: Selection Criteria for Titles and Abstract

Titles			
Criteria	Inclusion	Exclusion	Rationale
Keyword	Equity Premium, equity risk premium, estimation	Absence of keyword	The review looks at different techniques of estimating equity premium
	Equity premium puzzle, habit formation, Borrowing constraints, Crash states, rare disaster events, Overlapping generation, myopic loss aversion		This will help me to cover the literature relating to the explanation of ERP puzzle
	Macroeconomic factors, determinants, international macroeconomic factors, macroeconomic volatility		This will help me selecting the articles which identifies the factors that affect ERP
	International equity premium, time varying equity premium, international stock returns		This will identify the articles relating ERP in the international context
Abstracts			
Criteria	Inclusion	Exclusion	Rationale
Topic	Estimates ERP	Does not estimate ERP	The review aims to search studies which elaborate both theoretical and empirical estimation of ERP.
Macroeconomic factors	Includes Domestic or international macroeconomic factors that affect ERP	Does not discuss any domestic or international macroeconomic factors that affect ERP.	The review aims to identify the studies, in the existing literature, that identify both domestic and international macroeconomic factors affecting the ERP.
Explanation of ERP puzzle	Studies that explain the existence of equity premium puzzle or solve it.	Studies that do not explain the existence of equity premium puzzle or solve it	This will, in turn, help identify modifications required to the existing asset pricing models to explain the equity premium puzzle.
Time Period	From 1985 till date	Before 1985	Most of the modern literature about equity premium has been evolved since 1985, which will be reviewed in herein.
Academic and Practitioner Scholarly Journals	Peer reviewed journals	Non-scholarly journal, conference papers, news articles.	This literature review covers studies only from peer reviewed academic and practitioner journals. This does not mean that I will exclude working papers. However, working papers will be only selected, if any, based on strict quality criteria and their relevance.
Economies	UK and other Developed Economies	Non-developed economies	The review seeks to explore the factors affecting equity premium in UK and developed economies. Some papers may have other developed economies other than UK wherein they consider other factors/methodologies.
Approach	Empirical and theoretical	Non-empirical and non-theoretical	The review seeks to explore the theoretical development of ERP literature and its empirical implications

Table 8 gives the selection criteria for titles and abstract. The 543 articles which were taken further for the selection process went through the criteria mentioned in table 8. After which the total number articles screened for full papers were 120 i.e. out of 543 articles 423 were discarded as they did not pass the criteria mentioned in table 8

3.3.1 Selection Criteria for Full Papers

Once the papers were selected on the basis of titles and abstract, full papers were then selected based on different screening process and the selection criteria for this is given in table 9. There are different sets of criteria for theoretical/conceptual papers and empirical papers as these two types of papers serve different purposes and use different methodologies

Table 9: Selection Criteria for Full papers

Theoretical/Conceptual Papers must contain
1. The relevant theoretical background linking to the model(s) should be clearly discussed
2. Underlying assumptions regarding the conceptual framework and the models should explicitly stated.
3. All the relevant factors/variables of all the equations/models should be clearly stated.
4. Proofs and discussion of the results and theorems should be discussed clearly.
5. The limitation of the conceptual framework and/or the models should be clearly stated.
6. The findings of the study should be explicitly stated and warranted.
Empirical Papers must contain:
1. Empirical work should be aligned with existing theories or empirical work.
2. A clear description of the sample set, data sources, time-period and its validity to reach relevant conclusion
3. All the necessary variables should be clearly defined and explained.
4. The relevant methodology should be clearly explained providing its pros and cons.
5. Results should be explained and discussed clearly and should be aligned with the aim of the research
6. The study should highlight potential area of further research.

Out of 120 articles, which were remaining after screening for titles and abstracts, 39 articles were excluded based on the selection criteria mentioned in Table 9 and in total 81 articles were used for quality appraisal.

3.3.2 Quality Appraisal

Once the relevant papers passed the above selection criteria they were screened for their quality. Quality appraisal protocol is discussed in Table 10. Each selected paper was assigned a quality score for each criterion and only those papers which scored minimum 3 on all the criteria were selected. The quality scoring is as follows:

1. Not At All
2. Only to a limited extent
3. Acceptable level
4. To a significant level.
5. Completely.

The quality criteria are different for theoretical and empirical papers as these two types of papers serve different purposes and use different methodologies. Also their limitations and findings are different.

It should be noted that the quality assessment criteria gives a score, while the search criteria for the relevant papers in Table 9, is a nominal variable to accept (yes) or reject (No) the papers. In particular, we do not give a score or judge the quality of the paper based on Table 8 and Table 9. Whereas, in quality assessment criteria (Table 10), we assign quality score based on the preliminary criteria as set by the Table 8 and Table 9. In sum, preliminary research criteria set the foundation for the quality score.

Table 10: Quality Assessment Protocol for Theoretical/conceptual and empirical papers.

Theoretical/Conceptual Papers						
Criteria Code	Quality Criteria	Quality Scores				
		1	2	3	4	5
A	Is the relevant theoretical background linking to the model(s) clearly discussed and stated?					
B	Are all the underlying assumptions regarding the conceptual framework and the models explicitly stated?					
C	Are all the relevant factors/variables of all the equations/models clearly stated?					
D	Are all the necessary proofs and discussion of the results and theorems discussed clearly?					
E	Are all the relevant limitations of the conceptual framework and/or the models clearly stated?					
F	Are all the findings of the study explicitly stated and warranted?					

Empirical Papers						
Criteria Code	Quality Criteria	Quality Scores				
		1	2	3	4	5
A	Is the empirical work aligned with existing theory/ies or empirical work(s)?					
B	Is the methodology clearly and explicitly explained?					
C	Are the limitations and advantages of the methodology clearly stated?					
D	Is the sample set clearly stated?					
E	Are all the data sources explicitly stated?					
F	Are all the variables clearly defined and explained?					
G	Are the limitation(s) of the equations/models stated?					
H	Is the time-frame of sample set explicitly mentioned?					
I	Is the data collection method clearly mentioned?					
J	Are further research areas discussed?					

(Source: Huff 1999, pp.158)

Although quality assessment criteria is linked to the preliminary search objectives, Table 10 differs from the table 9 especially for the empirical papers in following two areas

- i) The limitations of the equations/models used should be explicitly mentioned.
- ii) The data collection method should also be mentioned explicitly.

When all these 81 articles were screened for quality not all of them scored minimum 3 in each of the criteria. Out of these 64 articles scored minimum three in each of the criteria mentioned in table 10 and so 64 articles ended up contributing for this review. The final list of the 64 articles contributing for this review is given in Appendix A. Table 11 gives in brief the stages of selection and number of articles in each of these stages. The quality score of each of the 64 papers for each of the quality criteria in table 10 for both conceptual and empirical papers are given in the appendix B.

Table 11: Stages of selection and number of articles at each stage

Sr. No.	Stages	No. of Articles
1	Total Search String results before applying criteria of table 4	2011
2	Total Search Strings results after applying the criteria of table 4	932
3	No. of Duplicate articles	(389)
4	Articles screened for titles and abstract based on criteria in table 8	543
5	Articles screened for full text based on criteria in table 9	120
6	Articles remaining after applying quality assessment scores based on table 10	64
7	Final No. of articles contributing for this review	64

Out of the 64 articles that contributed for this review, five articles were found by cross referencing.

3.4 Data Extraction

Once a particular paper passed all the quality assessment criteria it was imported into citation management software Mendeley. The relevant data was then extracted from the selected articles in the data extraction form, which is outlined in table 12, so as to construct a logical and critical argument about that paper (Dixon-Woods et al. 2006). This process was applied to all the selected papers in order to construct a coherent synthesis. The data extracted from for each of the 64 articles is outlined in detailed in Appendix C.

3.5 Synthesis

The information extracted from the final selected papers was used to construct a logical and coherent synthesis which has three dimensional purpose; i) provide clear description of the reviewed literature, ii) state the research gaps and iii) provide a logical argument that justifies my subsequent research question.

Table 12: Data Extraction Form

Citation
• Title
• Author(s)
• Journal/Source
• Year
• Key words
Study Background
• Research Question(s)
• Data Description
• Time Period
Methodology
• Model Employed
• Variables
• Economy
Contribution and Synthesis
• Key findings
• Theoretical Findings
• Empirical Findings

4 Descriptive Account of Literature

This section presents the descriptive account of the literature based on following two characteristics.

- 1) Journal Characteristics
- 2) Year of Publication of the article

4.1 Journal Characteristics

There are thirty-two different journals used for this review related to finance, financial economics, economics, political economy, international money and finance, monetary economics, etc. The ranking of the journal is based on Cranfield School of Management's journal recommendation for academic publication, published in February 2012. The journals are ranked according to following criteria:

4* = world-leading

3* = internationally excellent

2* = internationally recognised

1* = national

Table 13 gives the journals used for this review. Column 3 gives the number of articles used from that particular journal, column 4 gives the percentage of total number of articles from that particular journal and the last column gives the rank of the journal based on the above journal ranking criteria

Table 13: Number of Articles Based on Journal

Sr.No.	Journal	No. of Articles	(%)	Rank (*)
1	Annals of Operation Research	1	1.6	3
2	Applied Financial Economics Letters	1	1.6	0
3	Canadian Journal of Economics	1	1.6	3
4	Finance Research Letters	1	1.6	0
5	Financial Analysts Journal	1	1.6	4
6	International Journal of Finance and Economics	1	1.6	2
7	Journal of Applied Business Research	1	1.6	0
8	Journal of Banking and Finance	1	1.6	3
9	Journal of Business and Economic Statistics	1	1.6	3
10	Journal of Business Finance and Accounting	1	1.6	3
11	Journal of Economic Behaviour and Organisation	1	1.6	2
12	Journal of Economic Dynamics and Control	1	1.6	2
13	Journal of Economics and Finance	2	3.1	2
14	Journal of Financial and Quantitative Analysis	1	1.6	4
15	Journal of Financial Economics	8	12.5	4
16	Journal of Financial Planning	1	1.6	0
17	Journal of International Economics	1	1.6	0
18	Journal of International Money and Finance	1	1.6	3
19	Journal of Monetary Economics	5	7.8	4
20	Journal of Money, Credit and Banking	1	1.6	4
21	Journal of Political Economy	6	9.4	4
22	Management Science	2	3.1	4
23	Quantitative and Qualitative Analysis in Social Sciences	1	1.6	0
24	Review of Behavioral Finance	1	1.6	0
25	The American Economic Review	2	3.1	4
26	The Economic Journal	1	1.6	4
27	The European Journal of Finance	1	1.6	3
28	The Journal of Business	1	1.6	0
29	The Journal of Finance	6	9.4	4
30	The Quarterly Journal of Economics	5	7.8	4
31	The Review of Economics and Statistics	1	1.6	4
32	The Review of Financial Studies	5	7.8	4
	Total	64	100	



Figure 4: Distribution of Articles Based on Journal

Figure 4 gives the graphical representation of the number of articles used based on journal

Table 14 gives the top 6 journals contributing to the review:

Table 14: Top 6 journals contributing to the review

Journal	No. of Articles	(%)	Rank
Journal of Financial Economics	8	12.5	4
Journal of Political Economy	6	9.4	4
The Journal of Finance	6	9.4	4
Journal of Monetary Economics	5	7.8	4
The Quarterly Journal of Economics	5	7.8	4
The Review of Financial Studies	5	7.8	4

As can be seen from the table 14, Journal of Financial economics is the dominant journal contributing for this review with 8 articles (12.5% of the total articles) coming from it followed by Journal of Political Economy (6 articles, 9.4%), and The Journal of Finance (6 articles, 9.4%). Figure 5 gives the distribution of the journals based on ranking.

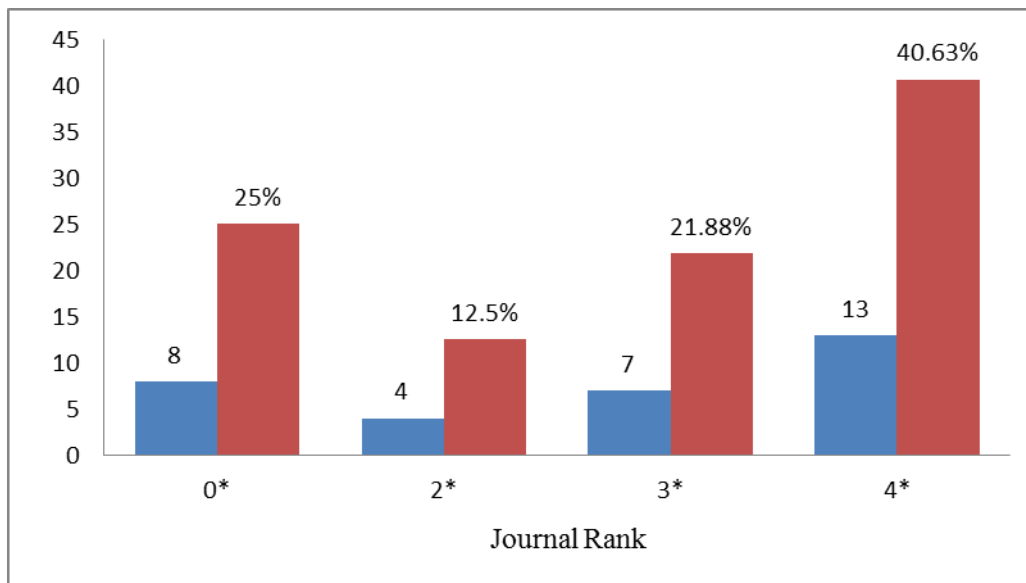


Figure 5: Distribution of journals based on ranking.

In figure 5, the number on the blue bar indicates the number of journals and the percentage figure tells the percentage of the total journal used. For example out of thirty-two journals used, thirteen are 4* journals which is 40.63% of the total number of journals used. Figure 6 shows the percentage of total number of articles based on journal ranking used for the review. Table 15 gives the number of articles based on the journal ranking.

Table 15: Number of articles based on journal rank

Rank of Journal	No. of Articles
0*	9
2*	5
3*	8
4*	42
Total	64

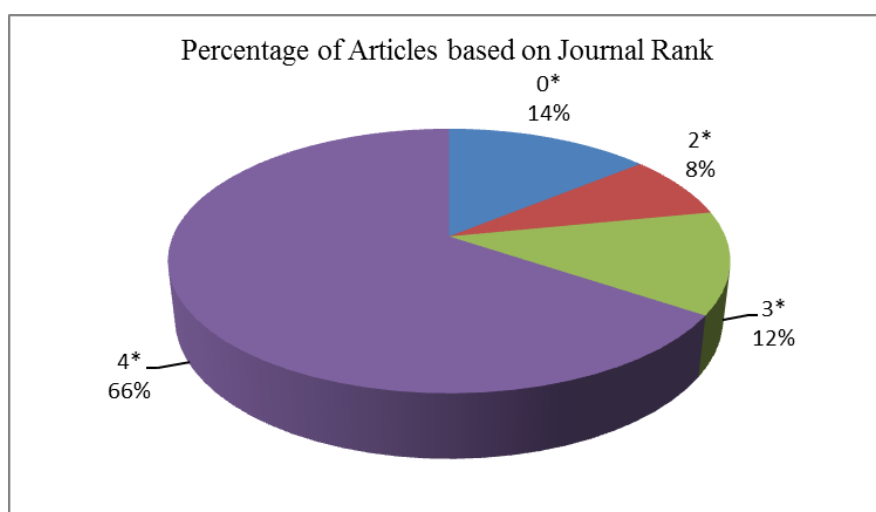


Figure 6: Percentage of the total number of articles based on journal rank.

As shown in figure 6, there are 66% of the articles that are from 4* journals.

4.2 Year of Publication of Articles

Figure 7 gives the distribution of number of articles based on the year of publication.

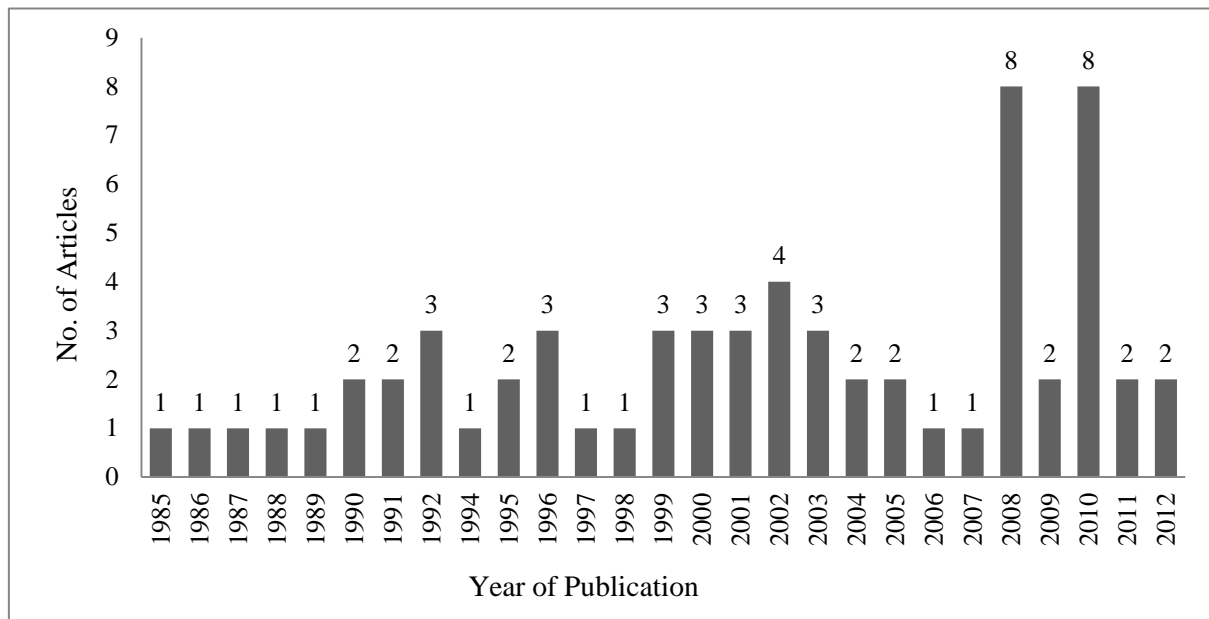


Figure 7: Distribution of number of articles based on year of publication

Table 16 gives the number, the cumulative number and the percentage of articles distributed based on the year of publication. It is evident from the tables that there were 26 articles published up until the year 2000 and the remaining 38 articles are post 2000 year. Majority of the 26 articles published up until 2000 were related to explaining the ERP puzzle although not necessarily. Some of them were related to ERP in the international setting. Whereas the remaining 38 articles that were published post 2000 are mainly concern either with empirical validation of the major theoretical development in the 1990s or extension of the theoretical and empirical work of the 1990s. However this does not mean that this field has reached to its theoretical saturation.

Table 16: No. of Articles based on year of publication.

Year	No. of Articles	cumulative no.	Per cent (%)
1985	1	1	1.6
1986	1	2	1.6
1987	1	3	1.6
1988	1	4	1.6
1989	1	5	1.6
1990	2	7	3.1
1991	2	9	3.1
1992	3	12	4.7
1994	1	13	1.6
1995	2	15	3.1
1996	3	18	4.7
1997	1	19	1.6
1998	1	20	1.6
1999	3	23	4.7
2000	3	26	4.7
2001	3	29	4.7
2002	4	33	6.3
2003	3	36	4.7
2004	2	38	3.1
2005	2	40	3.1
2006	1	41	1.6
2007	1	42	1.6
2008	8	50	12.5
2009	2	52	3.1
2010	8	60	12.5
2011	2	62	3.1
2012	2	64	3.1
Total	64		100.0

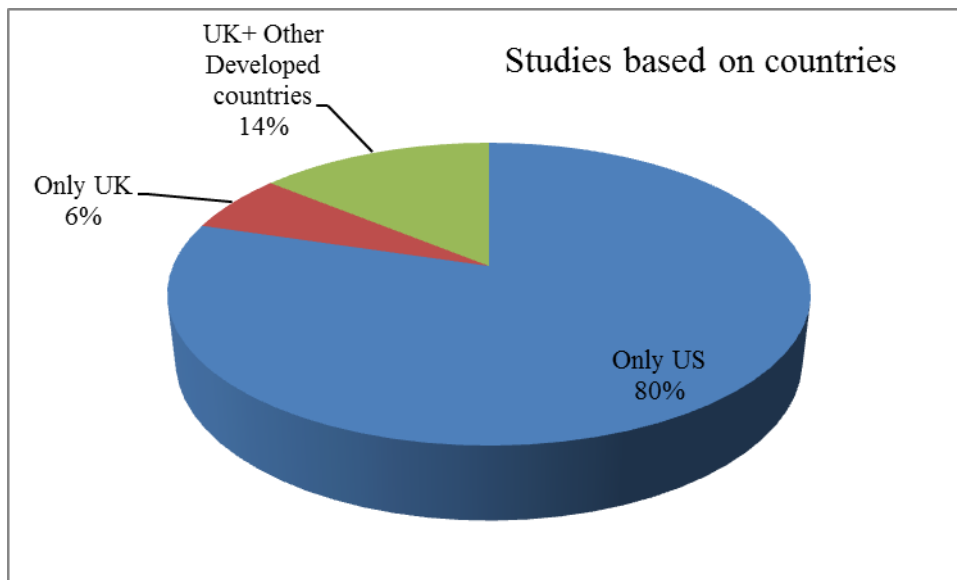
4.3 Analysis of articles based on countries

Table 17 shows the classification of articles based on the countries on which the studies were conducted. Figure 8 gives this classification in percentage of the total number of articles.

Table 17: Studies based on countries.

Studies based on countries		
Countries	No. of Papers	% of Total
Only US	51	79.69%
Only UK	4	6.25%
UK+ Other Developed countries*	9	14.06%
Total	64	100%
* Other developed countries: Canada, Germany, France, The Netherlands, Switzerland, Italy, Japan, and Australia.		

Figure 8: Studies based on countries (% of total no. of articles)



5 Thematic Findings

This section deals with the thematic findings of the reviewed articles. I have presented the findings in four distinct, yet complementary themes. The sub-section 5.1 is about the studies which deals with the estimation techniques of ERP. Sub-section 5.2 deals with the studies that try to explain and solve the ERP puzzle. This sub-section is further sub-categorised into four parts that basically looks at modifying the preference structure in the standard CCAPM so as to provide solution to the ERP puzzle. Sub-section 5.3 deals with studies which link ERP to macroeconomic variables using various econometric models. Finally sub-section 5.4 deals with studies regarding ERP in the international context

5.1 Estimation of ERP

Any review or a research on ERP is not complete if the various methods of estimation of ERP are not covered. As much simple as it sounds, the estimation techniques are equally complicated. Text book definition of ERP is simple; it is the excess market return on a risk-free rate. And yet the literature has no clear consensus of estimation technique which I demonstrate in this sub-section. For the purpose of this review, I have classified the literature on estimation technique of ERP as shown in the figure 9. Figure 9 shows two main categories of estimation techniques of ERP viz.

- 1) The Survey method: This method involves conducting survey with people of different professions namely Investors, Academics and Managers (Chief Financial Officers) about what they think ERP estimate should be for different time horizons.
- 2) Historical Premiums: This method basically involves estimating ex ante (expected or unconditional) ERP and ex post ERP (realised or the actual or the historic ERP).
 - i) Ex-Ante ERP: The ex-ante ERP is estimated using accounting methods (using company-specific accounting data), standard economic models (such as CCPAM), Time Series models (AR, ARCH, GARCH and ARIMA models) and using Fundamentals (aggregate data on valuation ratios, dividends, earnings etc.)

- ii) Ex-post ERP: Ex-post ERP is relatively simple to estimate. It is basically estimated using average realised stock returns, normally using a suitable market portfolio such as S&P 500, FTSE All Share Index etc. and a risk-free rate such yields on 3-month T-bills or 10 –Year Government Bonds. Arithmetic or geometric averaging technique is used to get the average returns.

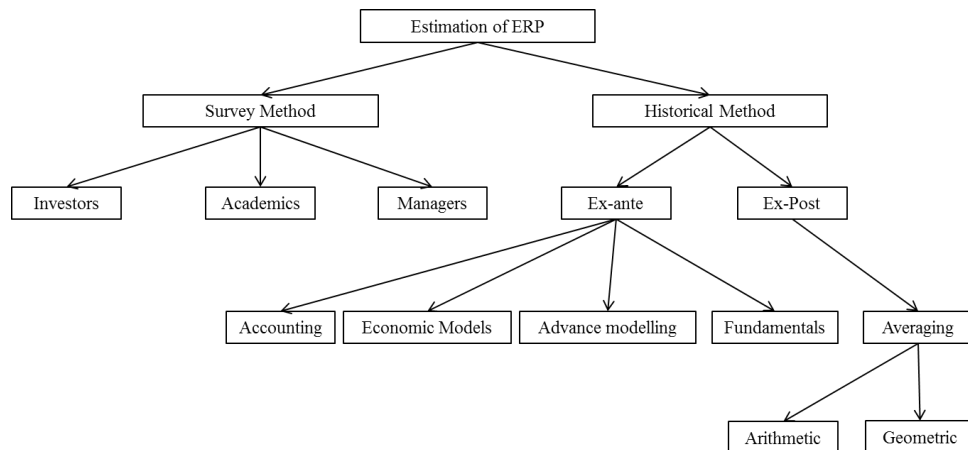


Figure 9: Estimation techniques of ERP

Welch, (2000) conducted a survey of 226 financial economists in the US to estimate arithmetic ERP. He conducted this survey by both designing the questionnaire on his website and by mailing them to the respondents. He found that on an average the ERP estimate for 10 year and 30 year horizon was 7% in real terms, and 6% - 7% for the horizon of one and six years respectively. The most pessimistic estimates of ERP over the horizon of 30 years were in the range of 2% - 3% and the most optimistic was in the range of 12% - 13%. Over 100 years of horizon, the estimate of ERP he found was 6.5%. One of the key finding of his survey was that there is term structure of ERP with lower ERP estimates at the lower time horizon and higher estimates corresponding to higher time horizon. The risk free rate used was 30 year T-Bonds and 3-month T-bills.

A similar survey technique was used by Graham and Harvey (2005). They surveyed 5014 Chief Financial Officers in the US to estimate a 10-year horizon ERP using yields on 10-year US T-Bonds as risk-free rate. The survey was conducted each quarter between the periods June 2000 to June 2005. The lowest estimate of ERP was 2.88% and the highest was 4.65%. In 2005 the implied ERP estimate of the S&P 500 index was 2.98% whereas the average ten-year risk premium for the whole period of the

survey was 3.64%. An interesting finding of their study was that there is no correlation between the past returns and the level of long-term risk premium and that long-run ERP moves together with the real interest rates. They also showed that there is positive correlation (0.44) between the estimates of ERP and volatility as implied by S&P 500 index options.

On the other hand Freeman and Davidson (1999) showed that ex-ante ERP estimated by using standard CCAPM model is not an unbiased estimate of ex post ERP. They showed that using CCAPM and CRRA power utility function of the following type

$$E \left[\sum_{t=0}^{\infty} \beta_t U(c_t) \right], 0 < \beta < 1$$

$$U(c, \alpha) = \frac{c^{1-\alpha} - 1}{1-\alpha}$$

$$\Rightarrow \lim_{\alpha \rightarrow 1} U(c, \alpha) = \ln(c, \alpha)$$

ERP can be estimated by using following equation

$$E(R_i) - R_f = \frac{\alpha \cdot \text{Cov}(R_i, R_c)}{1 - \alpha \cdot E(R_c)}$$

where, $E(R_i) - R_f = \text{ERP}$ (Difference between the return on risky asset i and risk-free asset R_f) $\alpha =$ risk aversion coefficient and R_c is the growth rate of aggregate consumption. They applied above system of equations to the UK economy for the period of 1974-1987 and showed that ERP estimated using standard economic model cannot be an unbiased estimate of ex-post ERP, a result isomorphic to the US economy as studied by Mehra and Prescott (1985).

Accounting method to estimate ex-ante ERP was used by O'Hanlon and Steele (2000) on the accounting data 172 UK companies between the period 1968-1995. They used abnormal earnings and return on equity (ROE) estimates of companies to estimate ERP. ERP was estimated as the slope coefficient of the plot of estimated ROE and the company's CAPM beta. The ROE and the company specific betas was estimated using following linear regression model,

$$ROE_{i,t} = \gamma_{3,i} + \gamma_{4,i} \cdot SURG_{i,t} + \varepsilon_{i,t}$$

$$r_{i,s} = \alpha_i + \beta_{a,i} m_{s-1} + \beta_{b,i} m_s + \beta_{c,i} m_{s+1} + \eta_{i,s}$$

$$\beta_i = \beta_{a,i} + \beta_{b,i} + \beta_{c,i}$$

where: *SURG* is the scaled unrecorded goodwill, $\gamma_{3,i}$ is the estimated cost of equity, γ_4 is the coefficient of ROE equation, $\varepsilon_{i,t}$ is the error term, $r_{i,s}$ is the share return on company *i* in month *s* and m_{s-1} , m_s and m_{s+1} are the returns FT-Actuaries All Share Index and β_i is the estimated beta of company *i*. The estimated ERP was in the range of 4%-6% using 3-month UK Gilts as risk free rate.

Fama and French (2002) used the fundamental approach to estimate ex-ante ERP for the period 1872-2000 in the US by estimating average stock return using dividend growth model and earnings growth model.

$$A(R_{d,t}) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GP_t)$$

Where $A(R_d)$ is the average return on stocks using dividend growth model, whereas the first term on the right hand side is the average dividend yield and the second term is the average capital gains. They argued that if dividend-price ratio is stationery over a long period, then the average capital gain approaches to average dividend growth rate. So they estimated the average stock return using following relation

$$A(R_{d,t}) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GD_t) \text{ --- dividend model}$$

where GD_t is the growth rate of dividends. The earnings model they employed was:

$$A(R_{e,t}) = A\left(\frac{D_t}{P_{t-1}}\right) + A(G_e) \text{ --- earnings growth model}$$

where, $R_{e,t}$ is the average stocks returns using the earnings model and G_e is the earnings growth rate. Their results can be summed in the following table 18

Table 18: Results of Fama and French (2002)

Period	ERP Estimates (%)		
	Dividend Model	Earnings Model	Actual
1872-2000	3.54	NA	5.57
1872-1950	4.17	NA	4.4
1950-2000	2.55	4.32	7.43

They also showed that by using 1-month T-bills rate as a risk-free rate instead of using 6-month commercial paper rate (which they used for the period 1872-1926), the ERP increases by 1%. A similar approach was taken by Claus and Thomas (2001), however they used the abnormal earnings approach to estimate ERP in the US, UK, France, Germany, Canada and Japan. By estimating the following equations

$$P_0 = bv_0 + \frac{ae_1}{1+k} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_5}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5} \right]$$

where $ae_t = e_t - k(bv_{t-1})$ is the expected abnormal earnings, P_0 is the current price of the stock e_t is the earnings forecast for year t , k is the expected return on the market and bv_t is the book value of equity, they showed that using 10-year government bond rates as risk free rate, the average ERP for the six developed economies was not more than 3%. However when they used the dividend growth model $k^* = \frac{D_1}{P_0} + g$ they found that the average ERP for the US, Canada, the UK, Germany, France and Japan was 7.34%, 5.89%, 7.91%, 6.58%, 7.90% and 5.83% respectively for the period 1985-1998. Campbell (2008) also used the fundamental valuation approach to estimate the ERP for the US, Canada and MSCI World index. He used a slightly modified version of earnings growth model used by Fama and French (2002). His model included the following system of equations:

$$\frac{D}{P} = R_e - G_d$$

$$G_d = \left(1 - \frac{D}{E}\right) ROE$$

$$\therefore R_d = \frac{D}{P} + \left(1 - \frac{D}{E}\right) ROE$$

But, $\frac{D}{P} = \frac{D}{E} \cdot \frac{E}{P}$

$$\therefore R_{ep} = \left(\frac{D}{E}\right) \cdot \left(\frac{E}{P}\right) + \left(1 - \frac{D}{E}\right) ROE$$

where $\left(\frac{D}{E}\right)$ is the dividend pay-out ratio, $\left(\frac{E}{P}\right)$ is the earning-price ratio, R_{ep} is the estimate of return using earnings model, ROE is the return on equity (profitability) and G_d is the growth rate in dividends D. He used this version to estimate the ERP using the three ratios. He estimated implied ERP assuming constant ROE of around 50%. This ERP was 3.3% for the MSCI World Index, (although he did not clearly mention which risk free he used to estimate the MSCI World ERP), 3.2% for the US and 3.1% for Canada. He used the return on inflation-indexed bond as risk-free rate for US and Canada. When he used the 3-year moving average for dividend pay-out ratio and 3-year moving average for ROE, then the estimates of ERP, using 0.75 weight on the long term estimate and 0.25 weight on the short term estimate, was 3.9% for the World Index, 4.1% for the US and 3.6% for Canada by the end of March 2007.

Advanced modelling techniques such Markov switching models, time series models and Bayesian techniques have also been employed to estimate ERP. Mayfield (2004) used two state (low volatility and high volatility) Markov process with structural shifts in the volatility to estimate ERP. He estimated the following model

$$R_i^t - R_f^t = \gamma \sigma_t^2 - \pi_t \ln(1 + J_t)(1 + K_t^*)^{-\gamma}$$

where $R_i^t - R_f^t$ is the ERP, γ is coefficient of relative risk aversion, σ^2 is the variance of returns which takes two sets of values in low and high volatility states, π_t is the instantaneous probability of change in the state, J_t is the change in wealth associated with change in state and K^* is change in optimal consumption level due to change in the wealth. The average ERP estimate in the low state was 12.4% and -17.9% in high volatility state. He also showed that ERP depends on volatility of returns and that about half of the estimated ERP is associated with future changes in volatility. On the other hand Pastor and Stambaugh (2001) used Bayesian technique to estimate ERP in stable

and transition regimes. They showed that ERP fluctuates between 3.9% and 6% in the US for the period 1834-1999. The inclusion of structural breaks i.e. the transition regimes, improves the precision of the estimates and due to this the ERP changes from 6.5% to 5.9% in the 1990s. They also showed that across the sample, with the inclusion of structural breaks, ERP is related to volatility of returns and ERP has changed over time and is decreasing since 1930s with few jumps in 1970s.

Time series modelling technique with simulated method of moments requiring numerical solution, was used by Donaldson , Kamstra and Kramer (2010) to estimate ERP in the US. The moments were simulated by AR(1), MA(1) and ARCH (1,1) technique. The market returns were estimated using

$$R_{m,t+1} = \lambda_t \cdot \text{var}(R_{m,t+1}) + \varepsilon_{m,t+1}$$

$$\text{Var}(R_{m,t+1}) = \omega + \alpha \cdot \varepsilon_{m,t}^2$$

$$\lambda_t = e^{\left(\delta_0 + \delta_1 \frac{D_t}{P_t}\right)}$$

where R_m is the market return, λ_t is the inverse of coefficient of risk aversion, and interest rates, dividend growth rates and conditional ERP was estimated using following models

$$\log(R_{f,t}) = \alpha_r + \rho_r \log(r_{f,t-1}) + \epsilon_{r,t} - - - \text{AR}(1) \text{ process for interest rate}$$

$$\log(1 + g_t) = \alpha_g + \rho_g \cdot \epsilon_{g,t-1} + \epsilon_{g,t} - - - \text{MA}(1) \text{ process for dividend growth}$$

$$\log ERP_t = \alpha_e + \rho_e \cdot \log(ERP_{t-1}) + \epsilon_{e,t} - - \text{AR}(1) \text{ process for ERP}$$

They called the above system of equation as their base model and they included different parameter settings in their base model to form 11 different types of model to estimate ERP. They showed by simulating the dividend growth rates and interest rates that the estimated ERP for the period 1952-2004 broadly matches the US data and is around 3.5%. $\pm 50\text{bps}$.

An altogether different approach was adopted by Appelbaum and Basu (2010) to estimate ERP and consumption process. They estimated an empirically tractable ERP

and consumption functions, independent of each other, and which were dependent only on the moments of the state variables. The consumption function involving the moments of the state variables, which they estimated was

$$C_t \equiv f(W_t, R_t, I_t, \sigma_R, \sigma_I) + \varepsilon_{c,t}$$

and the actual observed ERP function was

$$ERP_t \equiv f(W_t, R_t, I_t, \sigma_R, \sigma_I) + \varepsilon_{e,t}$$

where, W_t is the household's wealth, R_t is the return on equity investment, I_t is the household's income and σ_R, σ_I are respectively the standard deviations of R_t and I_t . By estimating the parameters by non-parametric method in the above ERP function for the period of 1921-2001 they were able to estimate the actual observed ERP in the US and in addition to that they were also able to show that the ERP was varying with time.

5.2 Explanation of ERP Puzzle

5.2.1 Habit Formation

This sub-section explains the importance of changing the preferences in the standard expected utility theory by relaxing the time-separability and by introducing subsistence level of consumption i.e. habit formation. Habit formation explains why standard model causes high ERP by using two broad types of habit; viz. External Habit, where the habit level or the subsistence level of consumption of an individual agent in both endowment and production economy is external to the agent i.e. aggregate consumption of all the agents in the economy was introduced by Abel, (1990) and Campbell and Cochrane, (1999) and the Internal Habit, where the agent's habit consumption or the reference consumption is compared to his/her own past level of consumption rather than comparing it to the whole economy was introduced by Constantinides (1990).

Constantinides (1990) used following expected utility of consumption for maximisation:

$$E_0 \int_0^{\infty} e^{-\rho t} \alpha^{-1} [c(t) - h(t)]^{\alpha} dt$$

where α is the risk aversion coefficient, ρ is the subjective discount factor, $c(t)$ is consumption in time t and $h(t)$ is the habit level consumption given by:

$$h(t) \equiv e^{-at} \cdot x_0 + b \cdot \int_0^{\infty} e^{a(s-t)} \cdot c(s) ds$$

where a and b are parameters. Applying the above sets of relations to the consumption process and stock return process he showed that, the stock return follows the process:

$$\frac{dS(t)}{S(t)} = \left(\frac{\delta_1}{\delta_2} \right) [(\mu - r)dt + \sigma dW(t)] + rdt$$

This relation shows that:

$$E \left[\frac{dS(t)/dS}{dt} \right] = \left(\frac{\delta_1}{\delta_2} \right) \cdot (\mu - r)$$

which is nothing but expected return on equity and which was set equal to 0.06 (6% per annum) as per Mehra and Prescott (1985) and the variance is

$$Var \left(\frac{dS(t)/dS}{dt} \right) = \left(\frac{\delta_1}{\delta_2} \right)^2 \cdot \sigma^2$$

which was set equal to $(0.165)^2$ as observed in the US data. Here δ_1 is proportion invested in equity and δ_2 is leverage ratio, μ , r and σ constants. He showed that ERP as high as in the actual US data can be shown with risk aversion coefficient as low as 2.81. His model also predicts that about 80% of the total level of consumption is the habit level of consumption which causes the high ERP.

On the other hand Abel (1990) and Campbell and Cochrane (1999) used external habit level of consumption in their utility function i.e. reference consumption level was endogenously decided by economy-wide aggregate consumption to show that ERP is affected by endogenously determined external reference level of consumption. In their

model individual compare their respective consumption with other agents in the economy. The utility function proposed by Abel (1990) was:

$$U(C_t, H_t) = \frac{\left[C_t / H_t \right]^{1-\alpha}}{1-\alpha} \dots \dots \dots \text{for } \alpha > 0$$

where H_t is the reference level of consumption specified as:

$$H_t \equiv [C_{t-1}^D, C_{t-1}^{A,D}]^\alpha \dots \dots \text{for } \alpha \geq 0 \text{ and } D \geq 0$$

where C_{t-1} is the individual's past consumption, C_{t-1}^A is the past per capita aggregate consumption. When $\alpha > 0$ and $D = 0$ then the utility function becomes external habit forming. Abel's (1990) model can be considered as a ratio model where the ratio of consumption to habit level consumption is used in the utility function, whereas Constantinide's (1990) model can be considered as difference model.

Campbell and Cochrane (1999) introduced a new variable called surplus consumption ratio in their utility framework which is given by:

$$S_t^a \equiv \frac{C_t^a - H_t}{C_t^a}$$

where superscript a stands for aggregate level (external to the individual). In equilibrium each individual's consumption are identical which means $S_t^a = S_t$ and $C_t^a = C_t$. This also means that as consumption falls towards habit level ($C_t \rightarrow H_t$), $S_t \rightarrow 0$ (extremely bad state) and people get more risk averse and this causes ERP to increase. The parameter that controls ERP in their model is called as local curvature η given by:

$$\eta_t \equiv - \frac{C_t \cdot U_{c,c}(C_t, H_t)}{U_c(C_t, H_t)} = \frac{\alpha}{S_t}$$

This means that as ($C_t \rightarrow H_t$), $S_t \rightarrow 0$ then $\eta_t \rightarrow \infty$ which then induces higher ERP (as observed in the actual US data), although α may be reasonably low. With this framework they showed that the stochastic discount factor i.e. the inter-temporal marginal rate of substitution m_t is given as

$$m_t \equiv \beta \cdot \frac{U'(C_{t+1}, H_{t+1})}{U'(C_t, H_t)} = \beta \cdot \left(\frac{S_{t+1}}{S_t} \cdot \frac{C_{t+1}}{C_t} \right)^{-\alpha}$$

On the other hand Yogo (2008) modified the utility functions in the above three studies by combining loss aversion with habit formation. He developed a new form of utility which is defined over “gains and loses” in consumption over habit level of consumption which he called it as reference level of consumption. His general form of utility function is combination of neo-classical utility as well as utility defined over losses and is given as:

$$U_{ref}(C, H) = \pi \cdot U(C) + (1 - \pi) \cdot W[U(C) - U(H)] \quad \text{---} \quad \pi \in [0, 1]$$

Where W is the gain-loss function as defined by Kahneman and Tversky (1979). The combination of neo-classical power utility $U(\cdot)$ with loss aversion, lead to following marginal utility of U_{ref} :

$$\frac{\partial U_{ref}}{\partial C} = \begin{cases} C^{-\alpha} \left[\frac{C^{1-\alpha}}{1-\alpha} - \frac{H^{1-\alpha}}{1-\alpha} \right]^{-\theta} & \text{---} \text{for } C > H \\ \lambda \cdot C^{-\alpha} \cdot \left| \frac{C^{1-\alpha}}{1-\alpha} - \frac{H^{1-\alpha}}{1-\alpha} \right|^{-\theta} & \text{---} \text{for } C < H \end{cases}$$

where λ is the degree of loss aversion and the external (H) is the geometric mean of the past consumption given by

$$H_{t+1} = \exp(\delta) \cdot H_t^\phi \cdot C_t^{1-\phi}$$

This shows that when consumption falls below the habit (reference) level, then the marginal utility changes by the degree of loss aversion. He used the AR(1) process for log of consumption to habit ratio $Y_t = \frac{C_t}{H_t}$ to show that intertemporal marginal rate of substitution is:

$$M_{t+1} = \beta \cdot G_{t+1}^{-\alpha} \cdot \frac{w(Y_{t+1})}{w(Y_t)}$$

$$\text{where } w(Y_t) = \begin{cases} \left[\frac{C^{1-\alpha}}{1-\alpha} - \frac{H^{1-\alpha}}{1-\alpha} \right]^{-\theta} & \text{--- for } Y_t > 1 \\ \lambda \cdot C^{-\alpha} \cdot \left[\frac{C^{1-\alpha}}{1-\alpha} - \frac{H^{1-\alpha}}{1-\alpha} \right]^{-\theta} & \text{--- for } Y_t < 1 \end{cases}$$

With the above system of equations, he then proposed relations for risk free rate and Sharp ratio from which he showed two interesting phenomena

- 1) Persistence of habit leads to decrease in the volatility of risk-free rate across the two economic states $\ln(Y_t) > 0$ (“economic boom”) and $\ln(Y_t) < 0$ (“economic bust”) whereas it leads to increase in the volatility of the risk free rate within the two states.
- 2) Reference dependent utility generates ERP which is closer to the actual US data (higher ERP).

Otrok, Ravikumar and Whiteman (2002) modified the habit preferences in the utility by using what they called spectral utility function. They decomposed the time series of consumption growth process into two components of low frequency volatility and high frequency volatility and they used AR(1) process to model growth in consumption process with autocorrelation 0.3, 0 and -0.3. They showed that with constant overall volatility of consumption, ERP is increased by 1600bps when the autocorrelation changes from 0.3 to -0.3 whereas the ERP increases by 1800 bps with constant low frequency consumption variance although the overall volatility of consumption remains constant.

5.2.2 Rare Disaster Events

This sub-section demonstrates that ERP is caused by rare/disaster economic or financial events that may actually occur or are perceived to occur. *“Risk-averse equity owners demand a high return to compensate the extreme losses they may incur during an unlikely, but severe, market crashes”*. (Rietz (1988; p:118)). His study was the first to link these types of rare but unlikely events with ERP. He introduced a third state of the economy, known as depression-like crash state, in the two-state economy of Mehra and Prescott (1985). By introducing this third state and by considering various scenarios of

the economic output in the crash state as a percentage of output in the normal state, he showed that as the probability of crash-states increases ERP also increases although keeping the structural properties of CCAPM and expected utility hypothesis intact i.e. keeping low risk aversion coefficient. This he showed by assuming that a crash state occurs following the two normal states with a low probability, during which the estimated first three moments of consumption growth process showed a dramatic changes. The dramatic fall in consumption, in the low-probability crash state, then induces higher ERP through the relations in CCAPM. For example he showed that when the output falls to half of that in the normal times, then a valid probability of crash of 0.0002 causes and ERP in the range of 5% - 7% with risk aversion (α) in the range of 8.85-9.00 and subjective discount factor (β) 0.991-0.999. However, Mehra & Prescott, (1988) responded that consumption declines of the magnitude in the range of 25% - 98% have never occurred in the US with the maximum decline of not more than 8.8%.

Salayer (1998) used similar methodology as that of Rietz (1988) to show that in a crash-like scenario, the mean value ERP is indeed affected by these scenarios, however he also showed the volatility of ERP comply with the restriction imposed by Hansen and Jagannathan (1991) on the first two moments of agent's IMRS and that the volatility of ERP cannot be explained by the introduction of crash-state.

Barro (2006) studied the empirical validity of Rietz (1988) by considering 60 disaster events in 35 countries across the period 1890-2004. He developed following relationship:

$$ERP = \alpha \cdot \sigma^2 + p \cdot (1 - q) \cdot [E(1 - b)^\alpha - E(1 - b)^{1-\alpha} - E(b)]$$

where, p is the probability of economic disaster per year, σ^2 the volatility of growth rate with no disaster, q contingent probability of government default, b is the size of economic contraction (as measured by drop in per capita GDP) and as usual α is the coefficient of RRA. He showed that average ERP, when the average baseline value of p of 1.7% per year and leverage ratio of one, was 7.2% across the countries and 3.6% when there was no leverage. He showed that ERP is nearly proportional to disaster probability but the strength of this proportionality depends on the RRA coefficient α .

ERP also depends on contingent probability of government default. A lower value of this mean risk-free asset is safer than equities in the event of an economic disaster.

A more sophisticated technique of understanding the impact of crash-states on ERP is by looking at option-implied ERP by employing Merton (1976) jump-diffusion model to option prices. In jump-diffusion model of Merton (1976) stock prices are assumed to follow exponential Levy process which is composed of two processes, a standard Brownian motion with constant drift and a Poisson's process to model "jumps" in asset prices. Mathematically, this is shown below:

$$S_t = S_0 \cdot e^{L_t}$$

$$L_t = \left[\left(\mu - \frac{\sigma^2}{2} - \lambda \cdot v \right) t + \sigma \cdot B_t \right] + \left[\sum_{i=1}^{N_t} Y_i \right]$$

The first square bracket on the right hand side in the above equation is the Brownian motion with drift μ and volatility σ^2 . The second square bracket is the Poisson's process N which has jump intensity of λ (number of "jumps" per unit time) which captures the spikes in risky asset price S_t which is modelled using exponential Levy process L_t . The size of the jumps (dx) follows a normal distribution $dx \approx \mathcal{N}(\rho, \delta^2)$ with density function

$$\text{size density of jumps } f(x_i) = \frac{1}{\sqrt{2\pi\delta^2}} \cdot \exp \left[-\frac{(dx_i - \rho)^2}{2\delta^2} \right]$$

This gives the lognormal process of returns of risky assets, which is given as:

$$\ln \left(\frac{S_t}{S_0} \right) = L_t = \left[\left(\mu - \frac{\sigma^2}{2} - \lambda \cdot v \right) t + \sigma \cdot B_t \right] + \left[\sum_{i=1}^{N_t} Y_i \right]$$

Santa-Clara and Yan (2010) applied Merton (1976) jump-diffusion modelling to S&P 500 options prices to show that ERP has four components, the variance of marginal utility of wealth, and the covariance of marginal utility of wealth with diffusive volatility, jump intensity and jump size. They showed that ex-ante ERP in the US in the period 1996-2002 varies 0.3% - 54% and during crash-events, jump risk commands 45.5% to 100% of actual ERP. Average ex ante ERP implied by option prices is 11.8%

while the ex post/actual ERP is 6.8% for realised volatility. Thus the required compensation is 70% more than actually observed. This conclusion supports Rietz (1988) and Barro (2006) work that ERP is associated with crash-events. Bollerslev and Todorov (2011) studied the asymmetric impact of the negative and positive jumps in high frequency short-dated out-of-the-money S&P 500 options and prices of S&P 500 futures on US ERP. The effect of negative jump intensity of -20% or more had more impact on ERP (12 times) than a positive jump intensity of 20%. Investors in the US were compensated for the negative events such as LTCM failure, October 1987 crash, Russian default of 1998 etc. more than for the positive events.

A more comprehensive study of impact of crash-states on asset prices and equity premium was done by Gabaix (2012). His framework consists of stochastic probabilities of disasters and recovery rates of both risky and risk-free assets in the event of disaster. He showed that by including disaster-like scenarios helps to find the cause of ERP as well as the time-varying nature of ERP due to time-varying nature of the severity of crash-events. He defined the resilience of an asset as its ability to perform well in the crash-states and higher resilient stocks have lower ex-ante ERP. The disaster model also implies that the covariance of stock returns with consumption during the crash-states is high.

On the other hand Julliard and Ghosh (2012) tested the above rare event hypothesis by estimating following Euler's equation of consumption on the set of 9 OECD countries in the period 1890-2009

$$E \left[\left(\frac{C_{t+1}}{C_t} \right)^{-\alpha} R_{e,t} \right] = 0 \text{ --- for } \alpha \in \mathbb{R}$$

They showed that the rare disaster event hypothesis does not support the fact that these types of events cause higher values of ERP. In order for these crash events to explain ERP, one has to assume that economic and financial disasters occur every 6 – 10 years and higher probabilities are needed to be assigned to these events. Additionally the likelihood of these types' events has to be increased by 4% - 6% than what is actually observed in the data.

5.2.3 Behavioural Finance

Advances in Behavioural Finance models have helped to explain what factors cause ERP. Particularly, there are two broad strands that sit in this sub-theme, which explains the causes of ERP. The first strand is based on the psychology of decision making process under uncertainty which is based on Kahneman and Tversky's (1979, 1992) prospect theory. Benartzi and Thaler (1995) used prospect theory to show that loss aversion (LA) among the investors and the frequency of evaluation of the performance of the portfolio causes high equity premium. They used following prospective utility function which is defined over gains and losses rather than on consumption, as is normally done in the standard literature;

$$V(x) = \begin{cases} x^\alpha & \text{if } x \geq 0 \\ -\lambda \cdot (-x)^\beta & \text{if } x < 0 \end{cases}$$

where $V(x)$ is the value function defined on the returns of bonds and equities, λ is the coefficient of LA and α and β are parameters. The prospective utility of a risky investment I is then defined over this value function as:

$$U(I) = \sum \pi_i \cdot V(x)$$

where π is the decision weight assigned to outcome i . They tried to find what length of time (evaluation period) is required by the investors in order for them to be indifferent from investing in stocks and bonds. They showed that the optimal evaluation period of one year is necessary to generate 6.5% ERP i.e. the more investors frequently assess the performance of the portfolio the more they get risk averse and demand higher premium from stocks. Their findings can be shown in the figure 10 which shows that as the evaluation period increases the implied equity premium decreases. On similar lines Barberis, Huang and Santos (2001) showed that ERP is indeed caused by LA, however they used standard expected utility theory wherein the utility was defined over consumption and financial wealth. They showed that it is not just LA that causes ERP but, the outcome of the previous investment decision also does i.e. prior losses make future losses more painful, and hence demand higher premium, however prior gains

make future losses less painful. This means that the utility has to be defined not only on consumption but also on financial wealth.

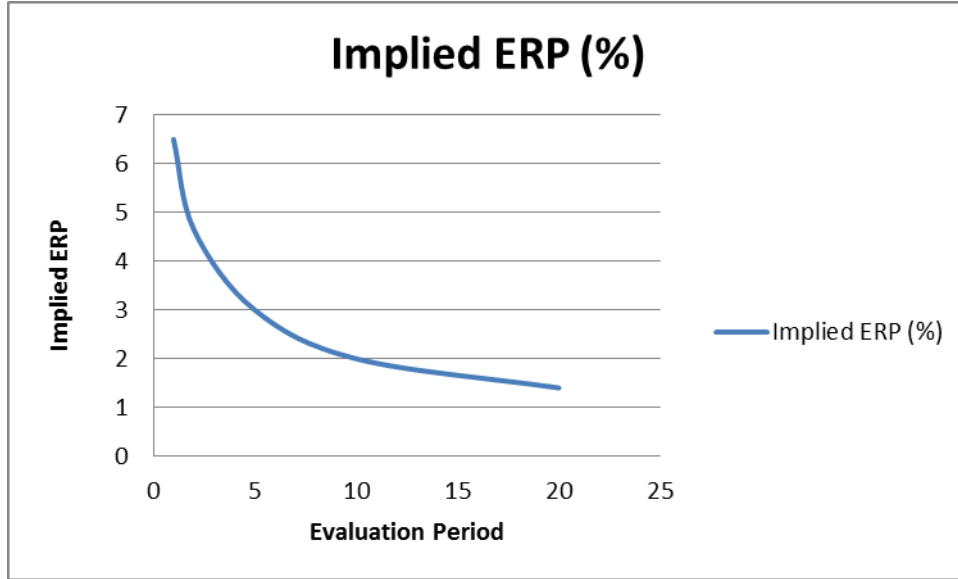


Figure 10: Relation between implied ERP and Evaluation period (Source Barberis, et al. (2001))

The second strand is based on the work of Gul (1991) of Disappointment Aversion (DA). Essentially, utility with DA preferences argues that outcome of gamble can be disappointing if that outcome is below a certainty equivalent i.e. below some reference. Bad outcomes make investors more risk averse and hence these outcomes outweigh the good outcomes i.e. the outcomes which are above the certain level. Thus investors are disappointment averse. Ang, Bekaert and Liu (2005) used the DA preferences in a CRRA utility defined over wealth, which is as follows;

$$U(W) = \frac{W^{1-\gamma}}{1-\gamma}$$

$$W = \alpha \cdot W_0(e^y - e^r) + W_0 e^r$$

$$\max_{\alpha} [U(W)]$$

and the utility with DA preference is μ_w given by:

$$U(\mu_w) = \frac{1}{k} \left(\int_{-\infty}^{\mu_w} U(W) \cdot dF(W) + A \int_{\mu_w}^{\infty} U(W) \cdot dF(W) \right)$$

where W is wealth, γ is the risk aversion and A is coefficient of DA. They showed that there exist a threshold level of A denoted as A^* such that if $A < A^*$ then investors do not prefer to invest in equities i.e. require higher premium to hold them. They calibrated their model to the US data for 1926-1998 to show that A^* of 0.37 corresponds to actual ERP of 6.55%. On the other hand Routledge and Zin (2010) extended the DA preferences to Generalised Disappointment Aversion (GDA) to show that their model can generate countercyclical risk aversion which leads to ERP in the range of 5.12% - 12.65%, which is very close to the reality. The word “*Generalised*” in their model comes from the additional parameter δ which captures how far the outcome of a risky gamble is from the certainty equivalent in order for it to be considered as disappointing. Their risk preferences are defined below;

$$U(\mu(p)) = \sum_{x_i \in X} p(x_i) \cdot u(x_i) - \theta \cdot \sum_{x_i \leq \delta(\mu_p)} p(x_i) \cdot (u(\delta(\mu_p)) - u(x_i))$$

where $p(x_i)$ is the probability of outcome x_i , $\mu(p)$ is the certainty equivalent and θ is the parameter of the model.

Fielding and Stracca (2007) combined these two strands (Loss Aversion and Disappointment Aversion) to show that LA partially explains ERP and requires more frequent evaluation period in order for the investors to be enough risk averse to generate ERP close to the data, whereas DA aversion gives a better explanation of ERP as it is independent of any evaluation period.

5.2.4 Incomplete Markets and Heterogeneous Agents

This sub-section deals with the studies which provide explanation to ERP puzzles based on the fact that capital markets are incomplete i.e. assuming that the economy is not frictionless and there are exogenous shocks to labour income which cannot be insured against. Aiyagari and Gertler (1991) studied the impact of transaction costs and heterogeneity in labour income on ERP. They argued that equity trading is associated with three types of costs namely brokerage, bid-ask spread and time and knowledge required to identify which shares to buy or sell. They also argued that these costs are substantially more than the cost of transacting the risk-free assets and therefore agents prefer to trade risk-free assets over equities in the event of an exogenous shock to their

labour income to smooth inter-temporal consumption. Therefore equities demand “more” premium not just in the form of compensation for the volatility risk but also to compensate the extra trading cost over and above the trading costs of risk-free assets. They considered smooth aggregate income (i.e. no aggregate shocks) however exogenous shocks occur to individual income due to job losses. Similar Heaton and Lucas (1996) studied the impact of transaction cost and borrowing constraints on ERP. Unlike Aiyagari and Gertler (1991), their theoretical model consists of both idiosyncratic and aggregate income shocks. Their model consists of agents which can hedge the idiosyncratic shock by trading in both risk-free and risky assets to smooth the consumption. They imposed constraint on trading and on borrowing and lending rates. In such a scenario they showed that transaction costs can account for almost half of the observed ERP.

However, Constantinides and Duffie (1996) demonstrated that inclusion of income heterogeneity and consumer heterogeneity, in an environment of incomplete consumption insurance i.e. in an environment where the opportunities to smooth out the inter-temporal consumption is very less, leads to prudent asset pricing model even without taking into consideration any market frictions or constraints. In their theoretical study they derived following expression for ERP:

$$ERP = E[R_{j,t+1}|\varphi_t] - R_{f,t+1} = \frac{Cov(R_{j,t+1}, H_{t+1}|\varphi_t)}{E[H_{t+1}|\varphi_t]}$$

$$H_{t+1} = \left(\frac{C_{t+1}}{C_t}\right)^\alpha \exp\left(\frac{\alpha \cdot (\alpha + 1)}{2} \cdot y_{t+1}^2\right)$$

And $y_{t+1}^2 = \log \left[\frac{\frac{C_{i,t+1}}{C_{t+1}}}{\frac{C_{i,t}}{C_t}} \right]$ is the variance of cross-sectional distribution of

consumption. In the above expression, $R_{j,t+1}|\varphi_t$ is the return on risky asset from time t to $t+1$ given the information set φ_t , $R_{f,t+1}$ is the risk-free rate, $C_{i,t}$ is the consumption of individual i and C_t is the aggregate consumption and α is the coefficient of RRA in a standard power utility function. Thus they were able to show that any risky security would demand a positive or a negative premium depending on the negative or positive covariance of its return with H_{t+1} , which is nothing but the Stochastic Discount Factor

(SDF) or the pricing kernel, without taking into consideration any market frictions or borrowing constraints. Brav, Constantinides and Geczy (2002) were able to empirically demonstrate the result of Constantinides and Duffie (1996) and went further to show that limited participation of households in the stock market and idiosyncratic shocks to income in a representative agent economy is able to explain higher ERP with lower risk aversion coefficient of three. This is because they showed that SDF is nothing but equally weighted values individual marginal rates of substitution.

A completely different form of heterogeneity among consumers was considered by Constantinides, Donaldson and Mehra (2002) in their overlapping generation model. They argued that the attractiveness of equity depends on correlation of its return with consumption which changes during the life-cycle of a representative agent. Young consumers have uncertain wage income and low correlation of consumption with equity return. In addition to that their marginal utility of consumption is high. Hence equities should be more attractive to young consumers than the middle-aged consumers who do not face the wage uncertainty and has relatively high correlation of consumption with equity return. The marginal utility of consumption of the middle-aged consumers is less and hence if their future consumption is correlated to equity returns, they will demand more premium from equities. However, the young consumers are constrained from participating in the stock market by imposing borrowing constraints against their future wage. This is because human capital alone is not sufficient as a collateral for the loan. Hence, equities are almost exclusively priced by low marginal middle-aged consumers and hence demand higher premium. The overall effect of borrowing constraint on young consumers is that it drives down the risk-free rate (as bond securities are almost exclusively demanded by middle-aged consumers) and increase the ERP.

Heterogeneity in the participation in the stock market and its potential impact on ERP was also studied by Mankiw and Zeldes (1991) by taking into consideration the food consumption of consumers who participate in the stock market. They showed that the distinction of consumption of stockholders and non-stockholders is an important input to understand ERP as their data showed that stockholder's consumption is more volatile and more correlated to stock market performance than that of non-stockholders.

Therefore, in such a system using aggregate consumption in the standard CCAPM to infer that the ERP is unusually high is inappropriate.

Figure 11 gives the visual overview of the literature that tries to resolve and explain the ERP puzzle.

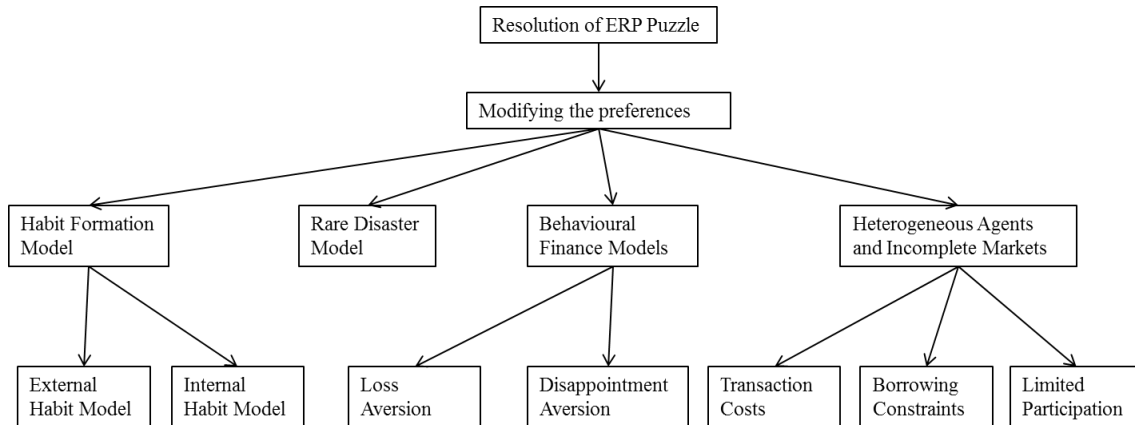


Figure 11: Literature for the resolution of ERP Puzzle

5.3 Macroeconomic Factors Affecting ERP

This sub-section deals with literature showing relation between macroeconomic and stock market factors with ERP developed in one particular economy. The relationship is developed by various modelling techniques such as linear and non-linear regression modelling, time series modelling like ARIMA, VAR and GARCH models, Markov regime-dependent and regime switching models.

Keim and Stambaugh (1986) regressed three variables viz. the spread on BBA-rated corporate bond yield and 1-month US T-bills yields, the change of S&P 500 with respect to its 45 years moving average level and the log price level of highly volatile stocks belonging to first quintile by size in the NYSE stock exchange, on the ERP of seven types of portfolio containing long term US Government bonds, High quality corporate bonds, BBA rated corporate bonds, BAA rated corporate bonds and first, third and fifth quintile, by size, of stocks on NYSE . They also considered the seasonality effect by taking in January-effect on the ERP. They showed that nearly 32% variation in the risk premium of the small stocks can be explained by the January-effect. The most important finding was that the risk premium on many assets, they considered, appeared to change with time. The regression was estimated using weighted least squares.

On the other hand Labadie (1989) demonstrated that stochastic inflation affects ERP through two channels: the first channel is through the covariance of marginal rate of substitution (MRS) with equity price and covariance of MRS with purchasing power of money. And the second channel is through the inflation risk premium. The inflation risk premium is the difference between the real return on nominal bond and the return on an inflation-indexed bond. Tristani (2009) incorporated this inflation risk premium to define the relative ERP as the actual observed ERP over and above the inflation risk premium. He studied the impact of monetary policy uncertainty on ERP and the natural rate of interest. He showed that the household's confidence in the Central Bank's ability to conduct monetary policy shapes ERP. The uncertainty of future monetary policy can affect the natural rate of interest, in equilibrium, by 10-20 bps while leading to increase in the ERP by 1.7%. Bansal and Coleman (1996) developed a monetary model of the economy in which assets other than narrowly defined money (risk-free government bonds) are used for transaction purposes or are used to back the instruments which are used for transactions viz. cash, cheques and credit. They assumed that because these assets are used for transaction purposes, the return on them is reduced due to transaction service return (transaction cost) which affects the return on risk-free assets and hence the ERP. They calibrated their model to the US data for period 1959-1991. When the parameters were estimated using GMM, the risk free rate was 1.12% compared to the actual value of 4%. The ERP in the actual data was 5.02% whereas the model estimate was 2.42% with RRA of 1.49 and subjective discount factor of 0.998 (both being in very reasonable range as predicted by CCPAM)

Another important variable which may have similar implications for ERP is the term structure of interest rate. Campbell (1987) studied the impact of term structure of interest rates on excess returns on bills, bonds and stocks in the US for the period 1959-1983 using regression analysis and estimating the first two moments of the excess returns using GMM. He used four term structure variables namely, one month T-bill, spread of 2-month T-bill over 1-month bill, spread of 6-month T-bills over 1-month T-bill and the one lagged value of the 2-month T-bills spread. He showed that excess returns on the three types of assets viz. bills, bonds and equity (ERP) can be predicted using these four term structure variables. Boudoukh, Richardson and Whitelaw (1997) studied this association of term structure with ERP in the US for the period of 1802-

1990. They showed that there is a significant non-linear relationship between the slope of the term structure of interest rate (difference between the yields on long term bonds and short term bonds) and equity premium. They conducted two tests to show this result. They estimated following regression:

$$ERP_t = \alpha + \beta_1 \cdot (\Delta R_{ls,t-1}) + \beta_2 \cdot \max(0, \Delta R_{ls,t-1}) + \mu_t$$

where $\Delta R_{ls,t-1}$ is the slope of the term structure of interest rate i.e. the difference between the yields of long and short term bonds. By estimating the coefficients in the above model they also showed that the magnitude and the sign of ERP depends on the slope of the term structure, in particular, ERP is positive when the slope term structure is positive i.e. upward sloping and is negative when the slope of term structure is negative i.e. downward sloping. An interesting result of their study is that variations in ERP do not depend on variations in the variance of ERP and the ERP is negative only when the covariance of equity returns with MRS is positive. A similar study was conducted by Kanas (2010) to assess the relationship between the ERP and the slope of term structure of interest rate by using data from the US, the UK and Japan. He showed that there is significant asymmetric regime-dependent non-linear relationship between ERP and the term structure. He used 2-state (low volatility and high volatility of ERP) Markov switching model to show that in the state of low volatility of ERP, the ERP in next year is affected by the increase in the slope of the term structure whereas a decrease in the slope or negative slope of term structure has no impact on next year's ERP. He estimated the following regime switching model:

$$ERP_t = \alpha(s_t) + \beta_1 \cdot (s_t) \cdot \min(r_{t-1}, 0) + \beta_2 \cdot (s_t) \cdot \max(0, r_{t-1}) + \sum_{i=1}^l \gamma_i(s_t) \cdot ERP_{t-1} + \mu_t(s_t)$$

with $\mu_t \sim N(0,1)$. Here (s_t) is the regime, r_{t-1} is the slope of the term structure of interest rate, β_1 and β_2 captures the effect of negative and positive slope of the term structure. A similar 2-state regime switching Markov process was used by Kanas (2009) to show a bi-directional relation between the bond maturity premium and ERP in the UK for the period 1900:2006. The two regimes were characterised by the first two moments of ERP and the bond maturity premium and were named as low volatility

regime and high volatility regime. He estimated following regime- switching VAR model for both ERP and bond maturity premium (BMP):

$$ERP_t = \alpha_e \cdot (s_t) + \sum_{k=1}^l \alpha_{e,e,k}(s_t) \cdot ERP_{t-k} + \sum_{k=1}^l \alpha_{e,b,k}(s_t) \cdot BMP_{t-k} + \varepsilon_{e,t}$$

with $\varepsilon_{e,t} \sim N[0, \sum s(t)]$ and

$$BMP_t = \alpha_b \cdot (s_t) + \sum_{k=1}^l \alpha_{b,e,k}(s_t) \cdot ERP_{t-k} + \sum_{k=1}^l \alpha_{b,b,k}(s_t) \cdot BMP_{t-k} + \varepsilon_{b,t}$$

with $\varepsilon_{b,t} \sim N[0, \sum s(t)]$. By estimating the above system of VAR models, he showed that both lagged values ERP and BMP can predict each other in the low volatility regime (bi-directional relationship). However the relation between the ERP and lagged BMP is positive while the relation between the BMP and lagged ERP is negative.

Pesaran & Timmermann (2000) utilised a recursive modelling methodology to predict the UK stock market returns. In particular they used UK macroeconomic variables to predict the excess stock return (equity risk premium). For this, their strategy involved classifying the variables/regressors in three main categories. The so called ‘core’ group involved those variables which are always included in a forecasting model and are considered to be of prime importance in the hierarchy of the categories as they have theoretical background in forecasting the performance of the UK stock market. The second category, known as ‘focal’ group, consist those sets of variables which are considered to be potentially important to be included in a forecasting model. They believe that variables in this category capture short-term fluctuations in business cycles, which have impact on ERP. The third and the final group of variables known as ‘potentially relevant’, consists of those variables which are left to the choice of investors. These variables can only be included in the forecasting models only if the investors think that the variables in the first two categories are not sufficient enough to forecast the ERP. Based on the above categorisation of potential variables they came up with following sets of variables:

1) Core Variables:

- a. Dividend yield on FTSE All Share index.

- b. Three month Treasury bill rate.
 - c. Rate of change retail prices.
- 2) Focal Variables:
- a. Change in 3 month treasury bills rate.
 - b. Change in the yield of 2.5% government consol.
 - c. A dummy variable to capture the January effect of each year.
- 3) Potential Relevant Variables:
- a. Rate of change of money supply.
 - b. Rate of change of Index of Industrial Production.
 - c. Rate of change of spot price of Oil.

They concluded that there is not only a statistically determinate relationship between the macroeconomic variables and the ERP but the lags of the variables also have significant impact on the excess return depending on the selection of models. Kizys and Spencer (2008) used tri-variate exponential GARCH-in-mean model to assess the impact of macroeconomic volatilities on UK ERP. They used volatilities in RPI inflation, industrial output and long term government bond yields to explain their impact on UK ERP. They showed that the UK ERP is associated with covariance of growth in output and equity returns. However the covariance of inflation with equity returns has no significant impact on the UK ERP. Secondly, they also showed that the UK ERP is highly affected due to the volatilities in the macroeconomic variables. A multi-variate GARCH in-mean model was use to understand the impact of business cycles and macroeconomic variables on US ERP by Smith, Sorensen and Wickens (2010). They showed that variance in output growth, inflation and money growth affects us ERP and that ERP is more sensitive to the negative supply shock than to the demand shock.

In order to consider the impact of corporate earnings, dividends, aggregate consumption and market crash-like events as in Rietz (1988), Longstaff and Piazzesi (2004) showed that ERP is composed of three elements. These are:

- 1) Consumption Risk Premium, which occurs due to covariance of aggregate consumption with the pricing kernel of the stock prices.
- 2) Event Risk Premium, which occurs due to catastrophic events in the stock market.

- 3) Corporate Risk Premium, which occurs due to covariance between the aggregate consumption and corporate fraction (ratio of aggregate dividend to aggregate consumption)

They derived the following ERP equation:

$$ERP = \alpha \cdot \sigma_c^2 - \lambda \cdot p_{j,mu} \cdot J_p + \alpha \cdot \varphi \cdot \rho \sigma_c \sigma_f$$

where α is the RRA, σ_c^2 is the volatility of aggregate consumption, λ is the jump intensity, $p_{j,mu}$ is the percentage jump in the marginal utility, J_p is percentage jump in stock price and φ is the elasticity of stock price to corporate fraction. When $\lambda = 0$ there is no catastrophic event and therefore no jump risk. When they calibrated the above model to the US data from 1929-2001, they found the consumption risk premium of 0.36%, event risk premium of 0.51% and corporate risk premium of 1.39% giving ERP of 2.26%, using risk aversion of five.

Bhar and Malliaris (2011) also studied the impact on dividends (fundamental variable) on the ERP of the US between the period 1965-2008 using three-state regime switching Markov process, in conjunction with other macroeconomic variables such as CPI inflation and unemployment and behaviour variable such as momentum. The momentum was defined as:

$$MMT \sim \sum_{i=1}^t e^{-i} \cdot r_{t-i+1}$$

where r_t is the price of S&P 500 index.

They estimated following two, 3- state-based models:

$$ERP_t = \alpha_{st} + \beta_{1,st}(\delta DIV) + \beta_{2,st}INF + \beta_{3,st}(\delta UEMP) + \varepsilon_{t,st} \quad - \text{for } st = 1, 2, 3$$

And

$$ERP_t = \alpha_{st} + \beta_{1,st}(\delta DIV) + \beta_{2,st}INF + \beta_{3,st}(\delta UEMP) + \beta_{4,st} \cdot MMT + \varepsilon_{t,st} \\ - \text{for } st = 1, 2, 3$$

They characterised the three states (st) by the low, medium and high volatility of ERP and studied the impact of the three groups of variables on ERP. They showed that the dividends significantly affect ERP in both the above models and in all the three states along with momentum. However, unemployment and inflation affect ERP asymmetrically in the three states. In contrast to this Goyal and Welch (2003) analysed the predictive ability of dividend ratios (dividend yields and dividend-Price ratios) on ERP. They showed that both dividend ratios have poor in sample and out-of-sample predictability of ERP. In fact they showed that predictive ability of the dividend ratios on ERP was always unstable across the their sample period. Similarly Welch and Goyal (2008) studied the impact of three main groups of variables. They are:

- 1) Stock Specific Variables: Dividends, dividend yield, earnings yield, stock variance, cross-section premium, book/market value raio, net equity expansion.
- 2) Interest Specific Variables: 3- months T- bills yields, long term yield, long term government bond rate, terp spread, yields on corporate AAA and BAA rated, defalut spread, default return spread, inflation
- 3) Investment to capital ratio.

They regressed the above independent variables on ERP and studied their ability to forecast ERP both in-sample and out-of-sample using their OOS statistic. Contrary to Bhar and Malliaris (2011), they found that the above set of variables do not have significant predicitilbity on ERP if they use regression for each and every variable both in-sample and out-od-sample. They used their OOS statistic to check the accuracy of the forecast. However, Campbell and Thompson (2008) responded to Goyal and Welch (2008) by estimating the out-of-sample performance of the same predictor variables to check whether they can predict ERP. They showed that the predictor variables used in Goyal and Welch (2008), indeed, can predict out-of-sample ERP under the restrictions imposed on the coeffcients of the regression model. The predictive power was less, nevertheless it was sufficient enough to be economically significant. Not only that Campbell and Thompson (2008) also showed that the predictors variables almost always outperform the historical average of the ERP as a predictor variable for future ERP. Similarly Rapach, Strauss and Zhou (2009) found contradictory results to that of Welch and Goyal (2008), by using same set of variables and by combining the forecasts of ERP produced by fifteen variables and fifteen regressions. By doing this they were

able to show that the selected variables do have out-of-sample predictive power on ERP.

To assess the impact of frequency of volatility of macroeconomic variables such as GDP, aggregate personal consumption expenditure and fundamental valuation ratio such as price to dividend ratio on ERP, Lettau, Ludvigson and Wachter (2008) carried out the two-state Markov regime switching analysis. They showed that ERP has been declining over time since the 1990s because of steady decline in the volatility of the macroeconomic factors i.e. reduced macroeconomic risk. Their model estimated that this low volatility regime in the macroeconomic variables at low frequencies will last for 125 quarters. Devaney (2008) studied the impact of macroeconomic variables on ERP in the US for the period of 1870-2002 by estimating the following regression equation:

$$ERP = \beta_0 + \beta_1.M1 + \beta_2MFP + \beta_3\delta Dy + \beta_4pop + \varepsilon_t$$

where, M1 is the growth in M1 money supply, MFP is the multi-factor productivity, δDy is the change in the dividend yield and pop is the population growth rate. He estimated the above regression model pre and post World War II to show that the predictive power of the different macroeconomic variables on ERP is changing through time.

Jermann (2010), on the other hand, studied the determinants of ERP by linking production and investment behaviour of a representative firm with its return in the stock market and risk-free rate of interest using the adjustment-cost functions and stochastic productivity as the main inputs. Effectively he extended the Q-Theory of investment to link microeconomics of a representative firm with its Sharpe's Ratio and risk free rate thereby providing expressions for ERP. When the first two unconditional moments of aggregate stock market return (proxied as the representative firm's stock return) and risk free rate simulated from the model were compared to the actual US data for the period of 1947-2003, he was able to show that his production-based model fits with the actual data quite significantly. He, therefore, was able to link firm's cost and revenue functions to its return in the stock market and risk free rate to show their impact on ERP.

Differential tax treatment on the income from equity investments and fixed-income securities, in particular investment in government securities, can also have a major impact on ERP. Favourable tax treatment to dividends as opposed to interest income from the risk free securities can significantly alter the perception of investors towards equity investment and fixed-income investment. The impact of tax policies on ERP and on the ERP puzzle was studied by McGrattan and Prescott(2003). They empirically showed that ERP is not unusually high i.e. it is not puzzling if one takes into consideration capital gains tax, brokerage and higher diversification costs. On the other hand Leibowitz (2003) argued that different tax rates applied to equity income and to the income from fixed-income security causes higher ERP as favourable tax policies towards equity acts as shield on the fixed-income security. He also argued that the after-tax ERP is unaffected by inflation.

5.4 International Studies on ERP

In the previous sub-section I demonstrated the domestic factors that affect the ERP in only that particular economy. In this sub-section I shall present evidences of global factors that are responsible ERP in multiple countries.

One of the pioneering study in this context was done by Bekaert and Hodrick (1992). They analysed the predictable components in the equity premium and foreign exchange markets in four major countries the US, the UK, Germany and Japan using pair-wise first-order vector auto-regression (VAR) of the type:

$$Y_t = \alpha_0 + \beta Y_{t-1} + \mu_t$$

where Y_t is the vector of equity premiums in domestic and foreign currency, nominal excess returns of foreign money market instrument on corresponding US nominal interest rate, dividend yields on foreign and domestic equity markets, β is the 6 X 6 matrix of coefficients and μ_t is the innovation in the Y_t . This VAR model was estimated on pairs of countries i.e. US – Japan, US- UK, and US- Germany in which US was considered to be the domestic country and the other three as foreign countries. They also estimated the latent variable model which they considered to be a counterpart to the above VAR system. They showed that equity premium can be predicted by dividend yields and forward exchange rate premium. A similar result i.e. the relation of equity

premium and forward exchange premium was demonstrated by Korajczyk and Viallet (1992) nine developed nations. They also showed that if the movements in stochastic discount factor as measured by the IMRS is explained by a diversified stock portfolio then movements in the forward exchange rate premium in time can be explained by movements in equity premium. However, the conditional mean returns on the forward exchange contracts have a component which cannot be explained by the returns on equity market portfolio.

Chan, Karolyi and Stulz (1992) studied the impact of foreign equity market on the US ERP by employing GARCH-in mean modelling and by using Nikkei 225, MSCI EAFE and MSCI Japan indices. They estimated parametric version of the following model:

$$E(R_{d,t}^e : \Omega_{t-1}) = \lambda \cdot [\omega_{d,t-1} \cdot \text{var}(R_{d,t-1}^e : \Omega_{t-1}) + (1 - \omega_{d,t-1}) \cdot \text{cov}(R_{d,t}^e, R_{f,t}^e : \Omega_{t-1})]$$

where $R_{d,t}^e$ is the excess return (ERP) on domestic US market and $R_{f,t}^e$ is the ERP on foreign equity portfolio (in this case Nikkei 225, MSCI EAFE and MSCI Japan indices) given the information set Ω_{t-1} at t-1, $\omega_{d,t-1}$ is the proportion of US market capitalization as a fraction of the world market wealth. The parametric version of the above relation, which was estimated, is:

$$R_{d,t}^e = \alpha_d + \beta_{d,t-1} \cdot \omega_{d,t-1} \cdot h_{d,t} + \beta_{dc}(1 - \omega_{d,t-1}) \cdot h_{c,t} + \theta_{d1}\varepsilon_{d,t-1} + \theta_{d2}\varepsilon_{d,t-2} + \varepsilon_{d,t}$$

and

$$R_{f,t}^e = \alpha_f + \beta_{f,t-1} \cdot \omega_{f,t-1} \cdot h_{f,t} + \beta_{fc}(1 - \omega_{f,t-1}) \cdot h_{c,t} + \theta_{f1}\varepsilon_{f,t-1} + \theta_{f2}\varepsilon_{f,t-2} + \varepsilon_{f,t}$$

where h_t is the conditional variances (suffix d for domestic and f for foreign), $h_{c,t}$ is the covariance and $\varepsilon_t \sim N(0, H_t)$ with

$$H_t = \begin{bmatrix} h_{d,t} & h_{c,t} \\ h_{c,t} & h_{f,t} \end{bmatrix}$$

By estimating the above GARCH-in mean process they showed that the conditionally expected ERP on S&P 500 index was proportional to conditional covariance between S&P 500 and Nikkei 225, but not significantly proportional to variance of S&P 500 index. In addition, they showed the strength of the proportionality decreased progressively when they used MSCI Japan and MSCI EAFE indices. Whereas, Ferson

and Harvey (1994) used factor regression modelling for 18 countries to show the impact of eight different variables, namely USD return on MSCI world index in excess of short term interest rate, log return of USD index measured as trade weighted index with G10 countries, unexpected global inflation for G7 countries, G7 industrial production growth rates, change in inflationary expectation of G7 countries, monthly change in long-term inflationary expectation of G7 countries, treasury-Eurodollar spreads (TED) and weighted average of short-term interest rate in G7 and changes in oil prices. They estimated the following factor regression for equity index returns of 18 countries:

$$ERP_{i,t} = \alpha_i + \sum_{j=1}^K \beta_{i,j} \cdot F_{j,t} + u_{i,t}$$

where $ERP_{i,t}$ is the USD ERP for country i , α_i and $\beta_{i,j}$ are regression coefficients, $F_{j,t}$ are K risk factors. Using this regression they showed that TED spreads, weighted average of G7 industrial production growth rates, unexpected component of weighted monthly global inflation of G7 and the weighted average of short-term interest rates in the G7 has no impact on ERP of country i , whereas the rest four variables have impact on ERP of any country i . They demonstrated that global risk factors can explain between 15% -86% variance in the monthly ex-post returns and that world market portfolio is the largest influencing factor accounting for 16-71% of the variation in the ERP depending on the country. An interesting finding was that as the number of risk factors in the model increase, much of the performance of the Japanese and Hong Kong stock market compensate for the global economic risk.

Longin and Solnik (1995) studied the stability of the correlation of equity premium across the time period 1960-1990 in seven major stock exchanges using GARCH (1, 1) process. The information variables used in the GARCH (1, 1) process was dividend yields and short-term interest rates for the variance equation. They found that the matrix of correlations and covariance of equity premium was unstable through the time. They also showed that the correlation rises in the period of high volatility across the seven markets and that the information variables can predict the future volatility of equity premium more reliably than the past values of equity premium. They suggested using more fundamental economic information variables to improve the model. Dropsy (1996) used seven different types of macroeconomic variables as information set to test

their predictability on ERP of four major stock markets, the US, the UK, Germany and Japan using three different types of modelling technique, linear regression, Non-linear neural network modelling (to test the out-of-sample predictability) and random walk model. They showed that the seven information variables predict ERP better by using linear regression model than the non-linear on the basis of Root Mean Squared Error, whereas the non-linear neural network model was better in predicting the out-of-sample ERP using the same seven conditioned variables.

To study the impact of inflation on ERP in the international setting Beirne and De Bondt (2008) considered a simple liner regression model between the inflation and ERP in major developed economies of Japan, Australia, Euro area, Germany, France, The Netherlands, Switzerland, the UK, the US and Canada. They estimated the following regression:

$$ERP_t = \alpha + \beta_t \cdot \pi_t + \varepsilon_t$$

$$\begin{bmatrix} \pi_t \\ ERP_t \end{bmatrix} = \gamma + \sum_{i=1}^2 \rho_i \cdot \begin{bmatrix} \pi_{t-1} \\ ERP_{t-1} \end{bmatrix} + \mu_t$$

where π_t is the inflation and α , β_t , γ and ρ_i are the parameters. They showed that there is strong positive relation between the inflation and ERP in these countries. In interesting finding of their study suggests that ERP has been decreasing over time and that inflation affected ERP predominantly prior to the 1990s but the effect has been decreasing since then. The low levels of inflation in the period after the late 1990s were the key contributor in explaining the low levels of ERP.

To summarise, Table 19 gives a snapshot of the entire thematic analysis of the papers reviewed. It shows number of papers in each theme and percentage weightage of each theme in the total thematic findings.

Table 19: Thematic analysis of the papers reviewed

Sr. No.	Theme	Brief Description	No. of Papers	% of Theme
1	Estimation of ERP	Studies that focus on various techniques of estimating the ERP.	11	17.2
2	Explanation and resolution of ERP Puzzle	Studies that propose modifications/improvements in the existing models to resolve the ERP Puzzle	1*	1.6
2.1	Habit Formation	Studies that attempt to resolve the ERP puzzle by introducing subsistence level (Habit) of consumption in the standard maximising utility framework.	5	7.8
2.2	Rare Disaster Events	Studies that incorporate the probability of existence of rare, but significant, financial and economic disaster events in the standard utility maximising framework to resolve the ERP puzzle.	8	12.5
2.3	Behavioural Finance	Studies that attempt to resolve the ERP puzzle by considering the behavioural finance models that are based on Prospect Theory and DA preferences.	5	7.8
2.4	Incomplete Markets and Heterogeneous Agents	Studies that attempts to resolve the ERP puzzle by considering market frictions, barrier to efficient market operations and heterogeneity in labour income, stock market participation and overlapping generations.	6	9.4
3	Macroeconomic Factors affecting ERP	Studies that links ERP (dependent variable) to macroeconomic factors (independent Variables) either to show their impact on ERP or predict ERP using time series models such VAR, various versions of GARCH (p,q) and by Markov switching models in one economy.	20	31.3
4	International Studies	These studies links ERP with macroeconomic factors in multi country environment and compares the ERP in multiple countries.	8	12.5
		Total	64	100

* Mehra and Prescott (1985) study which established the ERP puzzle.

6 Discussion

A careful investigation of the literature, covered so far, casts number of doubts regarding the way in which the literature perceives ERP. In this section I discuss the key insights of the literature pointing out limitations of the literature to understand ERP. Following which I discuss the future research directions that will help to overcome these limitations. I will also discuss the implications of these future research directions to both theory and practice.

Key Insight 1: I have shown in the sub-section 5.1 that even a simple concept like ERP has different ways and different complexities of estimation. Yet there is no clear consensus, in the literature, as to how the ERP should be estimated. Literature suggests using either returns on short-term government bills or long term government bonds as risk free rate. However, recent events in the market (the downgrade of US government debt in August 2011, the downgrade of UK and French ratings etc.) have shown that the government bond rates which were considered to be risk-free (“safe haven”) are no longer risk free and are subject to high short-term volatility. Also there is no clear consensus about which government security (if indeed a government security is considered risk-free) should be used to estimate ERP. No other assets or asset class is considered risk-free other than government bonds. In addition to this Mehra (2011) argued that it is not incontrovertible to argue that 3-months Government bills cannot be proxy of risk free rate based on the fact that households have little or no 3-months T-bills in their portfolio of savings which they can use to smooth the intertemporal consumption. *“Hence, T-bills and short-term debt are not reasonable empirical counterparts to the risk-free asset”* (Mehra 2011, pp.150)

Sometimes the same factors such as dividend growth rates, consumptions growth rates, earnings etc. gives different estimates of ERP when different models are used. Although Donaldson et al. (2010) have estimated ERP close to what is predicted by CCAPM yet, this requires very sophisticated modelling techniques and different forms of their base model to reach to their conclusion. Interestingly the estimates of ERP from the survey method are not at all close to the one estimated by using either the fundamentals or time series models. And not only that there is general consensus in the literature that ex-post ERP cannot be an unbiased estimate of ex-ante ERP and yet the profession continues to

use historic ERP as an estimate of unconditional ERP. In the literature the most common way of estimating ex-post ERP is by arithmetic averaging of returns.

Key Insight 2: The habit formation literature (sub-section 5.2.1) of Abel (1990); Campbell and Cochrane (1999) and Constantinides (1990) are marginally successful in explaining ERP. However, the model of external habit formation in consumption is restrictive to the reference consumption in a closed economy i.e. it does not consider the changes in the consumption pattern around the world and its potential impact on the domestic asset prices and ERP. Empirically the reference level of consumption in these studies is either a simple moving average or the exponential moving average of the past consumption in the US economy. However, in a globalised world economy where the producers and consumers of goods and services are no longer located in the same country, it is inadequate to consider the impact of reference level of consumption calculated using only domestic consumption. Domestic asset prices are also affected by the consumption process in the trading-partner's economy. As such the utility should be defined over four parameters, domestic consumption, domestic subsistence level of consumption, foreign consumption and foreign subsistence level of consumption.

Key Insight 3: In the rare financial and economic disaster events literature (sub-section 5.2.2) we have seen studies that support rare event hypothesis except Julliard and Ghosh (2012). None of the studies clearly shows that if a particular rare-event occurs, what exactly cause ERP. Is it the higher volatility in prices of equities or the volatility of the risk-free rate causes ERP? None of the studies clearly show the distinction between the impacts of a rare disaster event on performance of equities and risk-free asset. Do these types assets behave differently in economic disaster situation? And if so what is the impact of performance of individual class of asset on ERP? We do not get any clear insight from these studies as to what happens to other macroeconomic indicators such as base money supply and its potential impact on ERP. These studies also do not clearly establish how frequently a particular economic disaster should occur and how much should be the intensity of these events. Merton's (1976) jump-diffusion model lays the foundation for these questions. However, we do not have any empirical evidence as to what should be the optimal value of jump intensity (λ) and jump size (dx) in order to reconcile the ERP observed in the data. These studies also do not talk about the optimal

time frame of “pain” in the wake of a crisis that should exist in order to reconcile the observed ERP. These studies also do not show the potential impact of a financial crisis in one economy on the ERP of the other, for example the impact of failure of LTCM in the US, the Asian Financial Crisis of 1997, The Tequila Crisis of 1994 etc. on UK ERP. All the studies in this domain assume that an economic crisis (in particular drop in consumption or GDP) has to happen in order to reconcile high ERP. These studies neglect the fact that a financial crisis caused by a failure of systemically important sectors/institutions can also cause enough disruption in the market to make the investors more risk-averse i.e. most of the above studies restrict themselves as far the nature of crisis is concerned.

Key Insight 4: The behavioural finance literature (sub-section 5.2.3) tries to explain ERP using loss aversion and disappointment aversion strands. This literature basically tries to link the psychology of decision making process under uncertainty to risk aversion. However, the literature fails to capture the effect persistence of loss aversion or disappointment aversion on ERP i.e. how long the loss aversion exist before ERP return to its normal level. Barberis, Huang and Santos (2001) showed that the outcome of the previous investment decision has an impact future risk aversion and thus on ERP. However they fail to capture the effect of intensity of outcome and the frequency of such outcomes on ERP. There is no empirical evidence of such literature in the UK economy.

Key Insight 5: There is no clear consensus in literature (sub-section 5.3 and 5.4) concerning the effects of macroeconomic factors on ERP. Various authors have used numerous macroeconomic variables to show their impact or predictive power on ERP. On one hand there is a group of studies that show that fundamental factors such as dividends, earnings growth rate etc. have predictive power on ERP, however there are also group of study that contradicts this claim. In addition to this none of studies in that domain try to assess the impact of international macroeconomic factors on the UK ERP i.e. they fail to study the impact of risk premiums in foreign country on UK ERP and they fail to assess the impact of foreign macroeconomic variables on UK ERP.

Key Insight 6: Almost all the studies reviewed herein, uses constant relative risk aversion (CRRA) class of utility functions to either modify the preferences in the

standard economic model to estimate ERP and match it with actual ERP. That is to say they assume risk aversion to remain constant and do not change with time. However, none of the authors assess the impact of time variations in the risk aversion (inter-temporal risk aversion) on ERP.

6.1 Future Research Direction

Based on the findings in section 5 and its summary in table 19, it is evident that the review question/ sub-questions, proposed in the introduction, have been addressed. As shown in section 5.1 the literature proposes various methods of estimating ERP which are incontrovertibly mixed and unclear. In addition to this the literature fails to employ other techniques, which I have outlined in the future research direction (1), to estimate UK ERP. Section 5.2 presents a detail analysis of the explanations and the reasons, proposed by the literature, to explain the ERP puzzle. Figure 11 presents the overview of this literature. However the extant literature fails to employ the models stated in Section 5.2 to examine the ERP in the UK. I have outlined this in Future research directions (2), (3) and (4). Section 5.3 and 5.4 not only identifies the macroeconomic factors that affect ERP in closed and open developed economy setting but also the various modelling techniques employed in the literature to establish the link between these factors and ERP. Further, these sections show that ERP is dynamic in nature. However, the literature fails to explain and analyse the impact of international macroeconomic factors and cyclical factors such as political and business cycles on the UK ERP. I have outlined this in future research directions (5) and (6).

The possible future research directions are presented below on the basis of the research gap outlined in the above key insights.

Future Research Direction 1: To address the issue of estimation of UK ERP I propose to model the process of evolution of returns using government securities namely 3-months T-bills rates and 10- year government bond yield in the UK (as risk free rate) and the returns on FTSE 100 and FTSE All Share Index using following two techniques

- 1) **Markov Switching Multifractal:** This technique developed by Calvet and Fisher (2001; 2002; 2004) captures stochastic volatility component in the time series of asset returns better than GARCH model. This technique ensures to capture multi-frequency volatility clustering which is observed in the financial

times series data and which are caused due to business cycles fluctuations, technology shocks etc. The basic system of equations that describes this process is as follows:

The return series R_t of any asset is given as

$$R_t = \ln\left(\frac{S_t}{S_{t-1}}\right)$$

Then R_t is modelled as

$$R_t = \mu + \sigma \cdot [M(t)]^{1/2} \cdot \varepsilon_t$$

where, $M_t = (M_{1,t}, M_{2,t}, \dots, M_{k,t}) \in \mathbb{R}$ is a first order Markov state vector of the economy with k components, $\varepsilon_t \sim N(0,1)$ and μ and σ are the constants. The multiplier $M_{k,t}$ is drawn from the probability distribution of M with probability p_k or is equal to its previous value $M_{k,t-1}$ with probability $1-p_k$. The transition probabilities of the states is given by

$$p_k = 1 - (1 - p_k)^{(\beta^k - 1)} - \dots - p_k \in (0,1) \text{ and } \beta \in (1, \infty)$$

For small values of k , $p_k \sim p_1 \cdot \beta^{k-1}$

2) **Simulating Equity prices and Interest Rate using Stochastic Differential**

Equations: One way to estimate the UK ERP is by simulating the prices of the equity indices (FTSE 100 and FTSE All Share) and short interest rate (3-Month T-bills and 3-month Sterling LIBOR) using stochastic differential equations (SDE) involving stochastic volatility of both types of assets (Equity Index and Short Interest Rate). This is a novel approach to estimate UK ERP which is contrasting to the existing literature of estimating the ERP (Section 5.1). The reason for introducing stochastic volatility in SDEs is that it is well established fact that the volatility of the asset (Equity Index and Short Interest Rate in this case) is not constant across time and exhibit random process. The advantage of using SDE approach to estimate UK ERP is that it is independent of information set variables i.e. it is independent of macroeconomic variables that affect ERP. Hence, the estimate obtained by this method is unconditional estimate which is conditional only with the stochastic volatility of the underlying assets. Table 20 shows the models that I propose to utilise for simulation of FTSE 100 and FTSE All Share Index prices.

Table 20: Models for simulating the UK equity indices

Sr. No.	Model	Equations
1	Constant Elasticity of Variance (CEV) of Cox (1975)	$dS_t = M(t)S_t dt + V(t)S_t^{\alpha(t)} dW_t$
2	Heston's(1993) model	$dS_t = M(t)S_t dt + S_t \sqrt{V_t} \cdot dW_{1,t}$ $dV_t = \nu(t)[L(t) - V_t]dt + \sigma_V(t) \sqrt{V_t} \cdot dW_{2,t}$
3	Stochastic Volatility in Merton's (1976) jump-diffusion model	$\frac{dS}{S} = \mu_b dt + \sigma_b dW + k dp$ <p>dp follows the Poisson's distribution with intensity λ i.e. $P(dp) = \lambda dt$ and $k \sim N(\mu_j, \sigma_j^2)$.</p> $Prob(P = p) = \frac{e^{-\lambda} \cdot \lambda^p}{p!}$

The advantage of using the CEV model is that the volatility $V(t)$ of the stock price S_t is not only stochastic but the model itself takes into account the leverage effect. The advantage of using the Heston's(1993) model is that the diffusion follows the square root process and the drift in the volatility equation is a mean reverting linear process with speed $\nu(t)$. σ_V is the volatility of volatility. The advantage of using Jump-diffusion of Merton (1976) with stochastic volatility is that it can be used to model the impact of random spikes in asset prices ("jumps") which basically introduces jumps, taken from Poisson distribution, in a standard Brownian motion. The daily return series is assumed to contain two components

$$\ln\left(\frac{S_{t+1}}{S_t}\right) = \begin{matrix} x_t - if P = 0 \\ x_t + k_1 + k_2 + \dots k_p - if P \geq 0 \end{matrix}$$

Table 21 shows the models that I propose to employ for simulation of short-interest rate (3-months T-bills and 3-months Sterling LIBOR as risk free rate).

Table 21: Models for simulating the short-interest rates in the UK.

Sr. No.	Model	Equations
1	Vasicek's(1977) model	$dI_t = \alpha_t[L(t) - I_t]dt + V_t dW_t$
2	CIR model of Cox, Ingersoll and Ross (1985) (CIR)	$dI_t = \alpha_t[L(t) - I_t]dt + V_t \sqrt{I_t} dW_t$
3	Hull and White (1990) model	$dI_t = \alpha(t)[L(t) - I_t]dt + V(t)dW_t$

The advantage of using above three models is that all of them follow a linear mean reverting process with speeds α_t . The only difference in the Vasicek (1977) and Hull and White (1990) model is that in Vasicek (1977) the mean reversion speed of short rate I_t is independent of time whereas the in Hull and White (1990) it is a function of time. In CIR model the diffusion follows a square root process of I_t . The reason for proposing LIBOR as risk-free rate is that T-bills rate are artificially kept low due to the reserve requirements imposed on Banks. Hence there is a constant demand for government securities. Whereas, LIBOR indicates the money-market rate and is independent from any reserve requirements.

Once the simulation for both types of assets is run, ERP can be estimated by taking the difference of the mean (expected) values from estimated models.

Future Research Direction 2: Based on the above literature reviewed so far, there is no study yet that identifies the habit formation pattern in the UK per capita consumption which then links it to the UK ERP. As such, I propose to use external habit formation model of Abel (1990) and Campbell and Cochrane (1999) to estimate UK ERP. In particular I propose to use a representative agent model that maximises standard CRRA power utility function defined over the external habit reference, which will be estimated over surplus consumption ratio as in Campbell and Cochrane (1999) to test whether we can apply CCAPM to estimate UK ERP. In addition I postulate that the UK equity prices, as proxied by FTSE 100 index, are also affected by the foreign per capita consumption. One possible way to study the impact of the foreign per capita consumption on the UK ERP is to define the utility function of the representative UK consumer over the difference between his/her consumption and foreign consumption. It can take the form:

$$U(C_{h,t}) = \frac{C_{h,t}^{1-\alpha}}{1-\alpha}$$

$$\Rightarrow \lim_{\alpha \rightarrow 1} U(C_{h,t}) = \ln(C_{h,t})$$

Where $C_{h,t} = C_{d,t} - C_{f,t}$, $C_{d,t}$ is domestic per capita consumption in the UK, $C_{f,t}$ is the foreign/trading partner's per capita consumption and $C_{h,t}$ is the subsistence level of consumption and use the above utility to estimate UK ERP.

Future Research Direction 3: Key insight number 3 leads us to very interesting research direction and has the potential to contribute to practice. The literature reviewed so far fails to capture the impact of economic and financial disasters on UK ERP, empirically. This can be done by assuming that the UK stock price follows Merton's (1976) jump diffusion modelling as shown in the technique 2 of Future Research Design 2.

Future Research Direction 4: The key insight 4 leads to an interesting future direction. I propose to test the results of Barberis, Huang and Santos (2001) on the UK data. I propose to decompose the return series of FTSE 100 and FTSE All Share indices into states characterised by the volatility of the returns. I propose to estimate the ERP just before the series switches from one state to another (Markov Switching states) with their respective transition probabilities, and estimate the ERP after switching into new state. By comparing the ERPs in the two different states we can infer the effect of loss aversion on ERP. In addition to that we can estimate the speed at which the ERP recovers to its original level before switching of states by estimating following regression:

$$EP_l = \alpha_l + \beta_l(EP_h - EP_l) + \varepsilon,$$

where EP_l is the ERP in low volatility state, EP_h is the ERP in the high volatility state, $\varepsilon \sim N(0,1)$. The parameter β_l will effectively capture the recovery from the pain of changing states.

Future Research Direction 5: We have seen in the section that macroeconomic variables have impact on ERP however there different studies have contradictory claims regarding the effect of different macroeconomic factors on ERP. One of the important

characteristics of the studies in section 5 is that most of them use domestic factors to study their impact on equity risk premium by employing different statistical analysis. However Solnik (1974) and Driessen & Laeven (2007) have tested the benefits of international portfolio diversification. Due to globalisation and financial de-regulation in past three decades there is an increased amount of capital flowing across the developed and developing economies in the form of portfolio capital flows and debt capital flows to reap the benefits of international diversification. In such an environment where domestic stock market returns are governed not only by domestic macroeconomic variable but also by international macroeconomic variables, it has become important to understand the impact of international factors affecting the domestic stock and bond returns and therefore the ERP. The studies, that are reviewed, do not take into consideration the effect of international capital flows on the respective domestic markets and the interaction between the macroeconomic variables of different countries on the ERP. From the point of view of international portfolio diversification and international capital flows it also becomes vital to understand the impact of the equity premiums across the world on UK equity premium, that is, what is the impact of equity premium in G7 stock markets on the UK equity premium?

Following the Financial Crisis of 2008-2009 the central banks across the developed markets have tried to boost the aggregate demand by employing an ultra-loose monetary policy by drastically reducing the policy rates and expanding the monetary base. This has led to an environment of ultra “low yield” in which it is extremely difficult for investors to search for yield. Therefore the excess liquidity created by the central banks is now flowing across the world in search of yield and hence international macroeconomic factors plays important role in equity pricing and ERP. The literature so far fails to capture the effect of liquidity and market efficiency on ERP.

One of the important components of International Capital Flows is Foreign Direct Investment. Hope, Kang, Thomas & Vasvari (2009) have showed the importance of incorporating valuation of the foreign earnings in domestic equities in the US stock market. They showed that by taking into account the foreign earnings in valuing the domestic equities they have captured the information environment of firms in the US stock exchange. As mentioned in the Introduction, 70% of the earnings of of the

companies in the FTSE 100 index come from outside UK. The literature reviewed so far (including the studies conducted on the UK stock market) does not take into consideration the impact of earnings of domestic companies from foreign operations.

Mishkin (1996) argues that monetary policy affects the real economy through bank lending channel. He argues that expansionary monetary policy leads to increase in bank reserves and therefore by extension more loans can be issued to the real economy. Hence, banks have a profound impact on the economic activity of households, consumers and small businesses and therefore the 'health' of the banking system plays a crucial role in credit expansion and consumption. This 'health' of the banks can be measured by various ratios like capital adequacy ratio, liquidity ratios, non-performing assets ratio, etc. The ratio of cash to total assets can be a proxy of how much cash banks are holding on their balance sheet, which could otherwise be invested in the real economy. The reviewed literature does not take into account the role of banks in the economy and the impact of their 'health' on stock market returns.

One of the measures of the 'health' of the banking system is the LIBOR-OIS spread (difference between the LIBOR of various maturities and the Overnight Indexed Swap rates). The TED spread (spread between the 3-month LIBOR implied by Eurodollar futures and 3-months treasury bills interest rate) captures the credit risk and the counterparty risk in an economy. Both these spreads reached to their maximum levels during September 2008 following which we witnessed unprecedented stock market crisis. Although Longstaff et al (2004) captures importance of event risk premium as a contributor to ERP, yet this metric is based on probability of occurrence of such event rather than based on afore-mentioned indicators of 'health' of the banking system.

Kaserer & Berg (2008) have analysed the impact of Credit Default Swap (CDS) on ERP. They have estimated the ERP using 3-, 7- and 10- year CDS maturity. They did their analysis for the five years period (2003-2007) and estimated the ERP of 6.5% for the US stock market, 5.44% for the European Stock Market and 6.215% for Asian stock markets. The CDS on both sovereign bonds and corporate bonds have been shown to have a profound impact on equity markets. Although the reviewed literature covers a huge time period in their studies during which the CDS market had not evolved, yet the

study of Berg and Kaserer (2008) have shown that the impact of the CDS market on ERP cannot be dismissed.

Juster, Lupton, Smith & Stafford (2006) have studied the relationship between household savings rate and returns on stock market in the US. They showed that the decline in household savings ratio since 1984 can be accounted by the increased participation of the households in equities market i: e. the decline in the savings rate came more from capital gains from stock market than from any other asset class. Different countries have different household savings rate and different household participation in the stock market. This participation affects the returns on stocks and therefore the equity premium. The composition of household savings can also have an impact on equity investing as households in different countries prefer different asset classes for their savings and investment avenues. The reviewed literature does not take into consideration the impact of household savings rate and its composition on the equity returns and thus on equity premium.

Another class of asset that may have profound impact on equity risk premium is real estate investments. Mei & Lee (1994) have shown the importance of real estate investment, as an asset class, in asset pricing and portfolio management. They concluded that mutual funds managers should include real estate as an asset class in their diversified portfolio so as to take full advantage of diversification. Along with real estate, investing in commodities can play a vital role in stock market returns and therefore equity risk premium. Ankrin & Hensel (1993) have suggested the importance of investing in commodities by the pension fund managers. They suggest that pension fund managers can improve their utility by allocating commodities in their portfolio of investments. The literature reviewed so far does not take into account the importance of real estate and commodities in their studies as factors/determinants that can affect the equity premium.

I propose to test the predictive power of the macroeconomic variables on UK ERP which are outlined in table 22.

Table 22: Propose UK Domestic macroeconomic variables

Sr. No.	Variable	Explanation
1	Household Savings Rate	Household savings rate as a percentage of UK GDP
2	Variance of UK GDP growth rate	Measures the volatility of UK GDP
3	GDP Deflator	Measure of inflation
4	Unemployment rate	Self-explanatory
5	Growth rate in M3 supply	Measure of growth rate in broader money supply
6	Trade Deficit	Measures the net exports as a percentage of UK GDP
7	Time variation in the size of Stock Market	Measures the time variation in the changes in the market value of the all companies on London Stock Exchange as a percentage of UK GDP
8	LIBOR-OIS spread	Measures the difference between the 3-months Sterling LIBOR and rate on overnight indexed swap. This perceived to be the health of the banking system.
9	Financial Market Liquidity index	Measures Financial market Liquidity. Published by Bank of England. To capture the impact of liquidity on ERP
10	Market Efficiency Coefficient.(Liquidity Indicator)	Measures Financial market Liquidity. To capture the impact of liquidity on ERP

The Market Efficiency Coefficient is the price-based measure of liquidity and is given as:

$$MEC = \frac{Var(R_t)}{T \cdot Var(r_t)}$$

where, $Var(R_t)$ = Variance of logarithm of long period returns

$Var(r_t)$ = Variance of logarithm of short-period returns

T = Number of short period in each long period (e.g. 252 business days in a year)(Sarr and Lybek 2002)

To capture the impact of the international factors on UK ERP I propose to use the variables that are outlined in table 23

Table 23: Proposed International Variables

Sr. No.	Variable	Explanation
1	Oil Prices	Self-explanatory
2	S&P/ISDA International Developed Nations Sovereign CDS Index	Sovereign CDS Index of 18 Developed nations excluding the US. Tracks CDS market for 18 developed nation's sovereign entities.
3	TED spread	Difference between 3-month US treasuries yields and 3-month Eurodollar yields.
4	LIBOR –OIS	Difference between 3-month US treasuries yields and 3-month Eurodollar yields.

Future Research Direction 6: The literature covered so far fails to capture the effect of cyclical components on ERP. Although Smith et al. (2010) captured the effects of domestic business cycle on US ERP, yet they fail to capture the effect frequency of the business cycle on variation of ERP and at what frequencies these effects are dominant. They also failed to capture the impact of foreign business cycles on US ERP. As mentioned earlier 70% of the earnings of the companies in the FTSE 100 index come from outside the UK. Hence one cannot neglect the effect of business cycles or political cycles such the US Presidential Election Cycle etc. outside the UK on UK ERP. To give a simple glance about the effect the cyclical components on FTSE 100 index returns, I carried out a simple periodogram analysis on monthly log returns of FTSE 100 index from April 1984 to the beginning of August 2013 (352 observations). The data was taken from Datastream. The times series plot of these returns is shown in the figure 12.

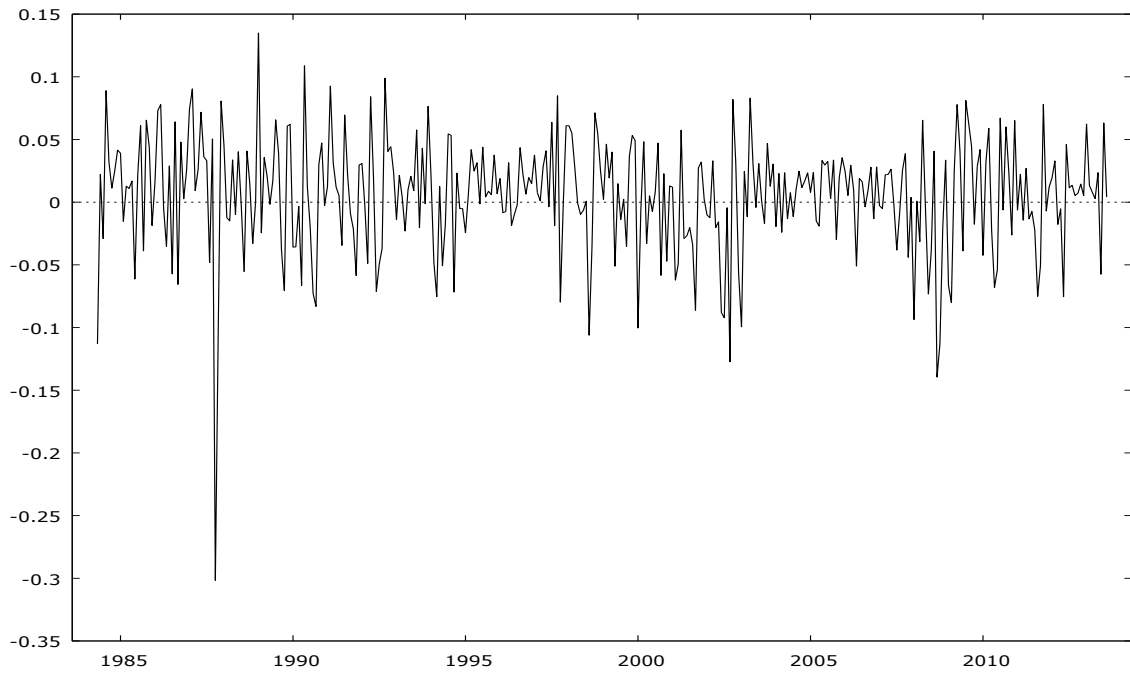


Figure 12: Time series plot of log of FTSE 100 returns

Visually, we can see from figure 11 that the log FTSE 100 returns are stationary. Table 24 gives the summary statistics, (using the monthly observations for the period 1984–2013) for FTSE 100 returns (352 valid observations)

Table 24: Summary Statistics of FTSE 100 log returns

Mean	0.00501354
Median	0.00948953
Minimum	-0.301699
Maximum	0.134918
Std. Dev.	0.0464011
C.V.	9.25516
Skewness	-1.14879
Ex. kurtosis	5.08028
5% Percentile.	-0.0754092
95% Percentile.	0.0734922
IQ range	0.0500945

Figure 13 shows the frequency distribution of these returns which shows that they are different from normal distribution. This is compared with the standard normal distribution.

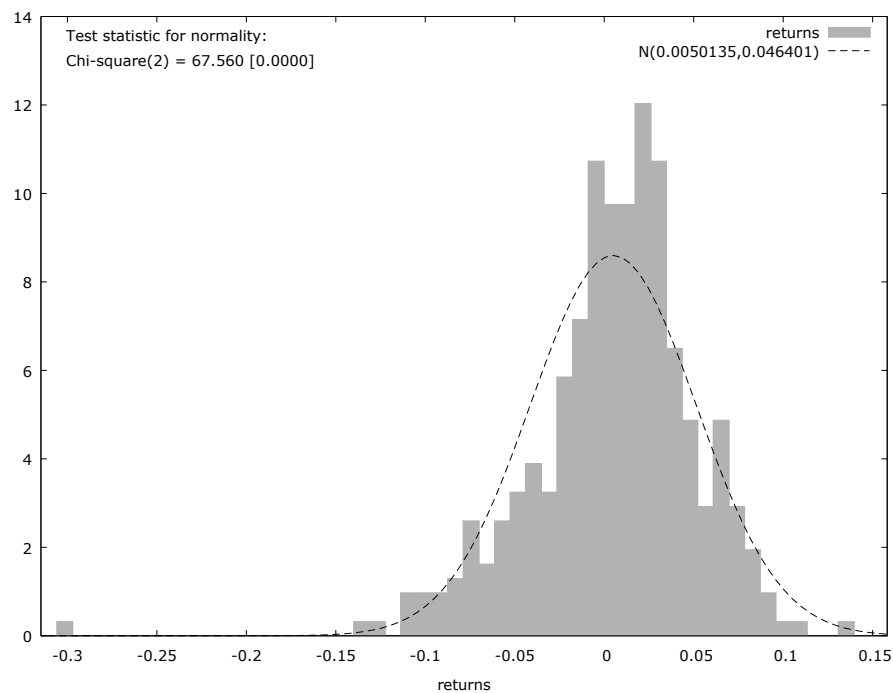


Figure 13: Frequency Distribution of FTSE 100 returns

The Augmented Dickey-Fuller test for the returns is given table 25. Panel A gives the test with a constant and panel B gives with a constant and trend.

Table 25: Augmented Dickey- Fuller Test

Panel A: With Constant. unit-root null hypothesis: $a = 1$	
sample size	348
model	$(1-L)y = b_0 + (a-1)*y(-1) + \dots + e$
1st-order autocorrelation coefficient for e	0
lagged differences F(3, 343)	2.014 [0.1117]
estimated value of $(a - 1)$	-0.950266
test statistic	-8.74362
asymptotic p-value	2.94E-15
Panel B: With constant and trend. unit-root null hypothesis: $a = 1$	
sample size	348
model	$(1-L)y = b_0 + b_1*t + (a-1)*y(-1) + \dots + e$
1st-order autocorrelation coefficient for e	0.001
lagged differences F(3, 343)	2.036 [0.1086]
estimated value of $(a - 1)$	-0.971647
test statistic	-8.84326
asymptotic p-value	2.30E-15

As can be seen form table 24, the p- value for test statistic for both types of test is quite significant suggesting absence of unit root in the return series.

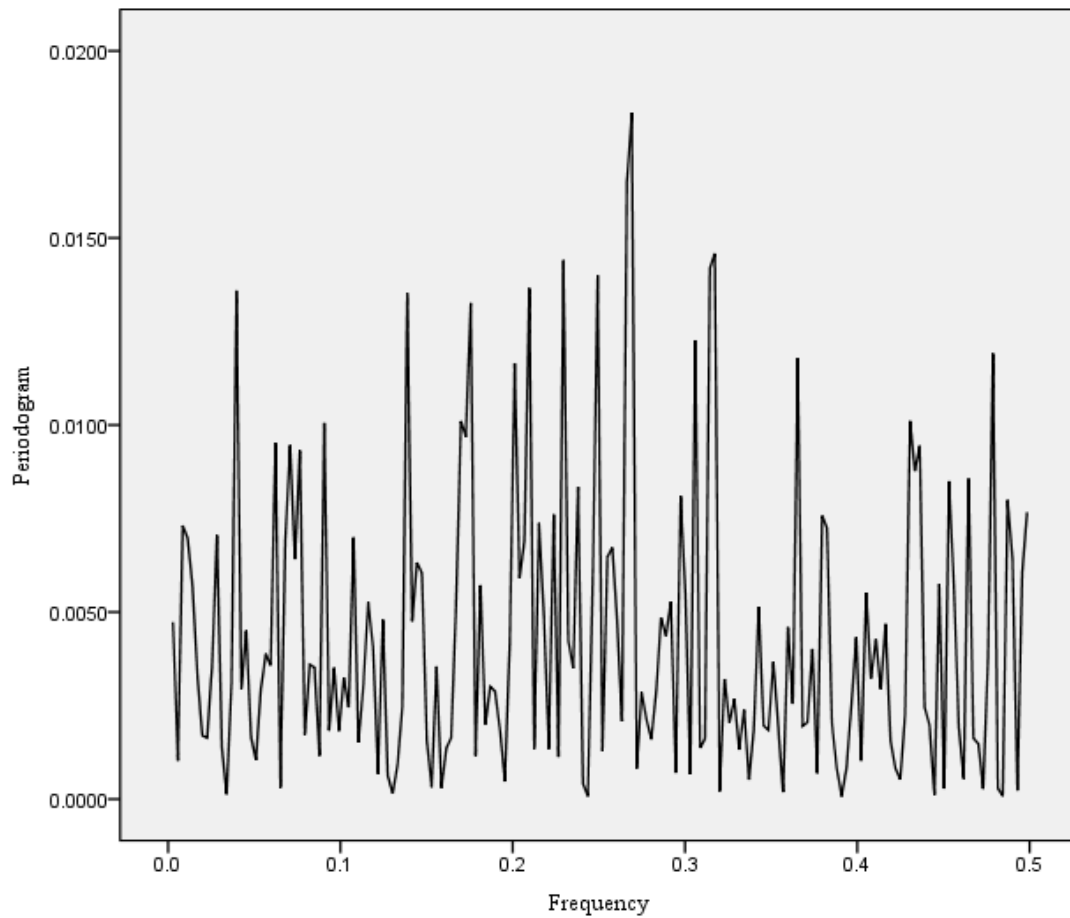


Figure 14: Periodogram of FTSE 100 returns based on frequency

Figure 14 shows the periodogram of the FTSE 100 index returns based on frequency. It shows significant peaks at various frequencies, particularly at frequency of approximately 0.26 which corresponds to period of 3.84 months. This can also be confirmed from figure 15 which gives the same periodogram based on period. The X-axis in the figure 15 is the period using liner scale. There is peak close to 3.8 months which roughly indicates quarterly periodicity. Similarly there we can see peaks at frequency of approximately 0.05 (20 months), 0.16 (6.25 months) etc. This shows that there is periodicity in the FTSE 100 monthly returns. One can expect this to reflect in the UK ERP calculated using FTSE 100 index as proxy of the market portfolio.

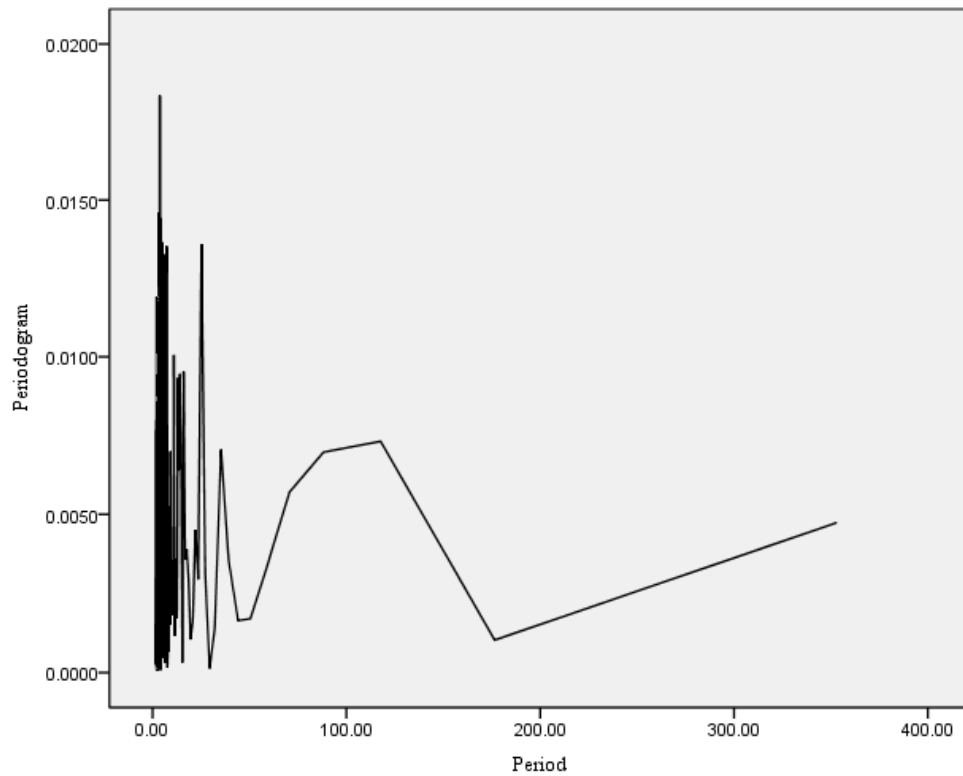


Figure 15: Periodogram of FTSE 100 returns based on period

Figure 16, on the other hand, shows the spectral density plot which is smoothed periodogram of figure 13 using Tukey-Hamming span factor of 5. The spectral density plot also confirms a dominant peak approximately between frequencies 0.25 and 0.28 (4 – 3.5 months)

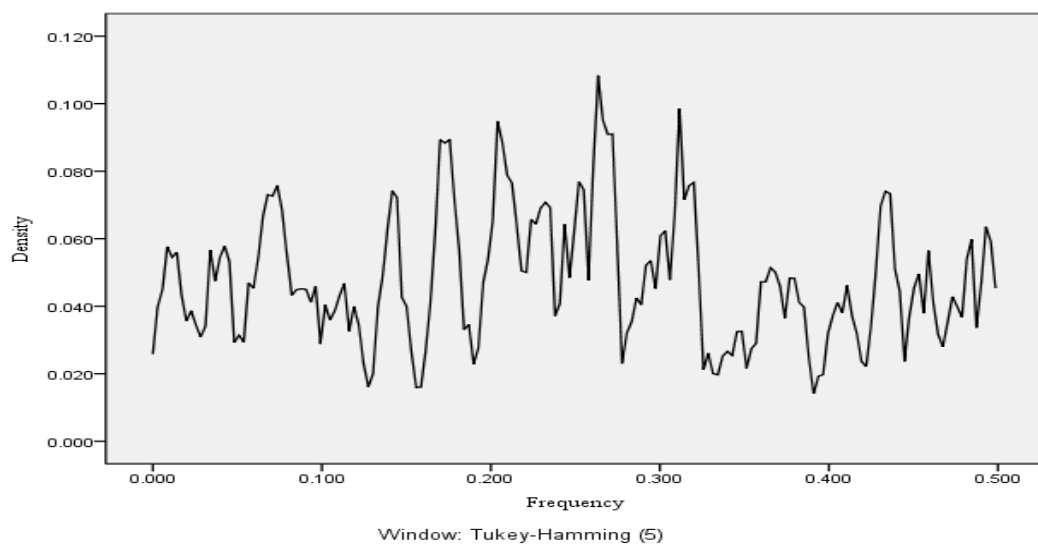


Figure 16: Spectral Density of FTSE 100 returns based on frequency

Essentially the periodogram breaks the times series into frequency domain and assumes that the time series can be composed of sinusoidal waves given by

$$R_t = \alpha \cos \omega t + \beta \sin \omega t + \varepsilon$$

where R_t is the monthly return on FTSE 100 index, ω is the angular frequency ($\omega = 2\pi f$ and $f = \frac{1}{N}$), θ is the phase angle such that $\alpha = A \cos \theta$ and $\beta = -A \sin \theta$, A is the amplitude and ε is the error term. This is done by Fast Fourier Transform. Minimising ε gives

$$\alpha = \frac{1}{\delta} \left\{ \sum R_t \cos \omega t \cdot \sum (\sin \omega t)^2 - \sum R_t \sin \omega t \sum \cos \omega t \cdot \sin \omega t \right\}$$

$$\beta = \frac{1}{\delta} \left\{ \sum R_t \sin \omega t \cdot \sum (\cos \omega t)^2 - \sum R_t \cos \omega t \sum \cos \omega t \cdot \sin \omega t \right\}$$

$$A = \sqrt{\alpha^2 + \beta^2}$$

where $\delta = \sum (\cos \omega t)^2 \cdot \sum (\sin \omega t)^2 - [\sum \cos \omega t \cdot \sin \omega t]^2$

With this the power function of spectrum of returns is given as:

$$f(\omega_k) = \frac{2}{N \cdot \{(\sum R_t \cdot \cos \omega_k t)^2 + (\sum R_t \cdot \sin \omega_k t)^2\}}$$

N is the number of periods (352 monthly observations in this case). In the above case the entire period N can be subdivided into periods of $N/1$, $N/2$, $N/3$... $N/176$ and the corresponding frequencies are $1/N$, $2/N$,.... $(N/2)/N$. Figure 15 is the estimated plot of $f(\omega_k)$ which is nothing but the spectral density function which helps in identifying the cycle period and therefore help in matching cyclical components in the returns series. Similar spectral analysis can be done on the time series on ERP of both FTSE 100 and FTSE All share index to confirm the existence of different cycles such as international business cycles, domestic business cycles, US Presidential Election Cycles etc. By employing spectral analysis in the time series of UK ERP I will be able to explain the behaviour of UK ERP more accurately and intuitively.

Figure 17 shows visually, the dimensions of the future research direction

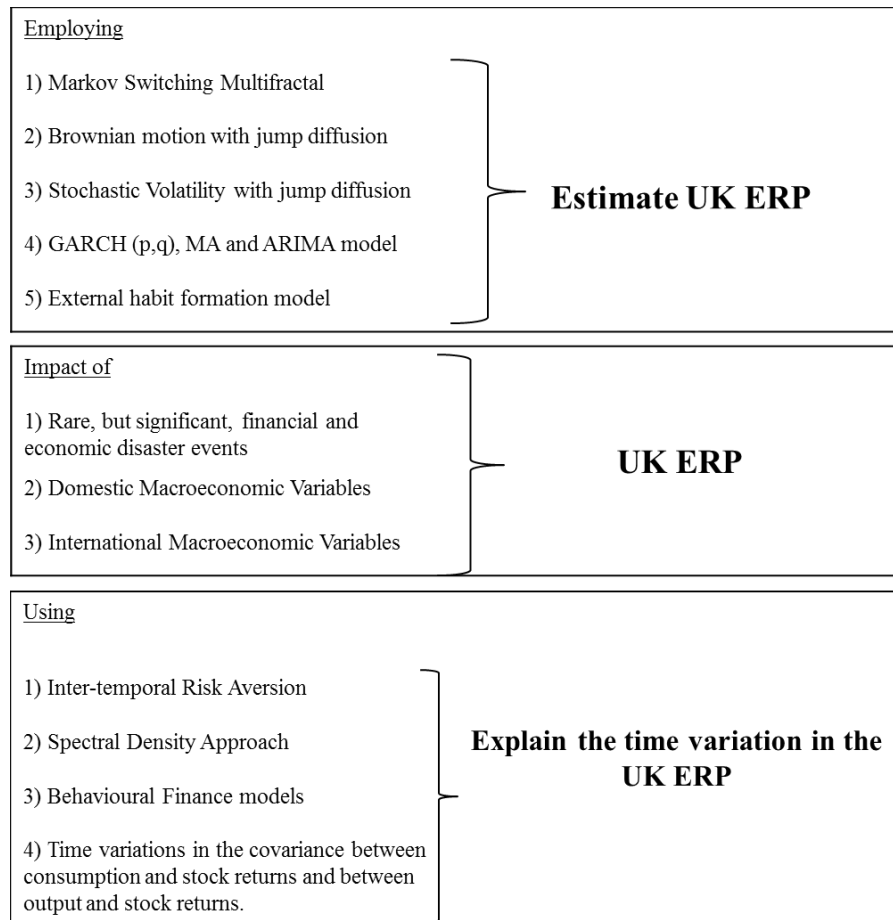


Figure 17: Dimensions of future research.

6.2 Implications for my PhD

The identification of the limitations of the existing literature and the proposed future research directions has significant implications for my further PhD study. Combining all the future research directions I plan to answer the following research question in my doctoral study.

What are the key determinants of UK Equity Risk Premium?

In order to provide maximum justice to the above research question I propose following overarching questions that will help answer my main research question mentioned above.

- 1) How should the UK ERP be estimated?
- 2) What is the impact of rare, but significant, financial and economic disasters on UK ERP?

- 3) Do behavioural finance models help in explaining the UK ERP?
- 4) What are the UK domestic and international factors that can help predict the UK ERP?
- 5) How can we explain the time variation in the UK ERP?

6.3 Academic Contribution

This review is first of its kind which provides a systematic and succinct overview of the literature on equity risk premium by covering different sub-bodies of literature right from estimation of ERP through ERP puzzle and various explanations of the puzzle up to various macroeconomic factors affecting ERP in both domestic and international context. Based on this review the overarching questions number 1, 3 and 5, which I proposed above, are the key drivers of academic contribution as it involves a novel and advanced technique to estimate ERP, as mentioned in the future research direction 1, and test the effect of behavioural finance models on UK ERP. In addition to this another key driver of academic contribution from my PhD study is to test the effect of international macroeconomic variables on UK ERP, something which is new to the literature.

6.4 Practical Contribution

Majority part of my research has valuable practical contribution. By answering the overarching questions 2 and 4, this research will help both domestic institutional and foreign institutional investors to understand the behaviour of the UK ERP. This will further help them to improve their estimation in weighted average of cost of capital. In addition to this it will help equity research analyst in the Discounted Cash-flow Valuation in forecasting the equity prices based on the fundamentals of the companies. It will help in asset allocation decisions taken by fund managers of Pension Funds, Mutual Funds, OEICs, Unit Trusts, Exchange Traded Funds, and Hedge Funds. And last but not the least this research will help Foreign Institutional Investors to take the decisions of Portfolio Investment in the UK economy.

As such there is a tangible balance of contribution to both academic and practitioner community.

7 Conclusion

This review systematically investigated the extent to which the literature understands equity risk premium in four broad categories. The first is the estimation of equity risk premium which deals with the issues in estimating the ERP. The second is the ERP puzzle and studies that have tried to explain the puzzle through various theoretical lenses. The third and fourth are the domestic and international factors that help predict ERP. Finally after having investigated the existing literature and problematizing it I have discussed the limitations of the literature and have established key gaps in the literature. I have also proposed preliminary methodology and other macroeconomic variables that will help to fill the gap in the literature.

7.1 Limitations of the review

The literature on the Equity Risk Premium is vast and therefore there ought to be some limitation on any review conducted on such a matured topic, especially when one tries to make the review manageable. However, that is also true for any field in social science. This review has three limitations.

First this review is dominated by positivist paradigm in financial economics which is a social science concept. Especially in my case an intangible psychological concept of risk aversion is studied in positivist ontology and epistemology. However, review has covered the behavioural finance literature that explains the equity risk premium, but in a positivist paradigm. The research in equity risk premium is highly dominated by deterministic view and as such an interpretivist may have a completely different perception about risk aversion and equity risk premium.

Second, the review question reflects my biasness of looking at the literature of ERP. This may have resulted in neglecting certain studies which may have indirectly contributed to my review. This may be because I did not selected articles from working papers or any handbooks etc. However, to overcome this I decided not to impose any restriction on the articles coming from any particular journal rank, as defined by Cranfield School of Management's Journal ranking. I have included articles from all the journal ranks.

Third, the quality assessment tool and the quality scores are the result of my critical judgement about the quality of the work in any particular study and may have been very strict in order to have manageable number of articles in the review. This is subjective as different researchers will have different opinions and judgement about the quality.

7.2 Personal Learning

Personally, there are two levels of learning that I experienced during this thesis project. The first is methodological learning. I found this process of systematically looking at literature very rigorous and demands discipline, especially maintaining the audit trail. I realised the importance of evidence-based knowledge how to overcome my biasness. However, I am not fully convinced that this methodology is completely appropriate for reviewing literature related to finance and financial economics. I found the process of extracting the relevant information from an article in the data extraction form to be very tedious and to some extent subjective. However I did realise the importance of it only after doing it for all the 64 articles. It does give a good snapshot of the papers I have reviewed. This will be very valuable for my PhD.

The second level of learning came from the contents of the paper that were used for the review. I learned how to problematize the literature and identify the opportunities for further research. I have also learned new modelling techniques to model a financial time series. After having gone through the articles I now realise how Physicists, Mathematicians and even Botanists got involved in finance!

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Appendices

Appendix A List of Studies Included

Sr. No.	Authors(Year)	Journal	Ranking (*)
1	Keim and Stambaugh (1986)	Journal of Financial Economics	4
2	Campbell (1987)	Journal of Financial Economics	4
3	Reitz (1988)	Journal of Monetary Economics	4
4	Labadie(1989)	Journal of Monetary Economics	4
5	Constantinides (1990)	Journal of Political Economy	4
6	Abel, (1990)	The American Economic Review	4
7	Aiyagari and Gertler (1991)	Journal of Monetary Economics	4
8	Mankiw and Zeldes (1991)	Journal of Financial Economics	4
9	Korajczyk and Viallet (1992)	Journal of International Economics	0
10	Chan, Karolyi and Stulz (1992)	Journal of Financial Economics	4
11	Bekaert and Hodrick (1992)	The Journal of Finance	4
12	Frenson and Harvey (1994)	Journal of Banking and Finance	3
13	Longin and Solnik (1995)	Journal of International Money and Finance	3
14	Benartzi and Thaler, (1995)	The Quarterly Journal of Economics	4
15	Bansal and Coleman (1996)	Journal of Political Economy	4
16	Heaton and Lucas (1996)	Journal of Political Economy	4
17	Constantinides and Duffie (1996)	Journal of Political Economy	4
18	Boudoukh, Richardson and Whitelaw (1997)	Management Science	4
19	Salyer (1998)	Journal of Economic Dynamics and Control	2
20	Dropsy (1999)	Journal of Applied Business Research	0
21	Campbell and Cochrane (1999)	Journal of Political Economy	4
22	Freeman and Davidson,(1999)	The European Journal of Finance	3
23	Pesaran and Timmermann (2000)	The Economic Journal	4
24	Hanlon and Steele (2000)	Journal of Business Finance and Accounting	3
25	Welch, (2000)	The Journal of Business	0
26	Barberis, Huang and Santos (2001)	The Quarterly Journal of Economics	4

27	Pastor and Stambaugh (2001)	The Journal of Finance	4
28	Claus and Thomas (2001)	The Journal of Finance	4
29	Otrok et. Al(2002)	Journal of Monetary Economics	4
30	Fama and French (2002)	The Journal of Finance	4
31	Brav, Constantinides and Geczy (2002)	Journal of Political Economy	4
32	Constantinides, Donaldson and Mehra (2002)	The Quarterly Journal of Economics	4
33	McGratten and Prescott(2003)	The American Economic Review	4
34	Goyal and Welch (2003)	Management Science	4
35	Leibowitz (2003)	Financial Analysts Journal	4
36	Longstaff and Piazzesi (2004)	Journal of Financial Economics	4
37	Mayfield E.S (2004)	Journal of Financial Economics	4
38	Ang, Bekaert and Liu (2005)	Journal of Financial Economics	4
39	Graham and Harvey (2005)	Finance Research Letters	0
40	Barrow (2006)	The Quarterly Journal of Economics	4
41	Fielding D. and Stracca L	Journal of Economic Behaviour and Organisation	2
42	Welch and Goyal (2008)	The Review of Financial Studies	4
43	Beirne and de bondt (2008)	Applied Financial Economics Letters	0
44	Kizys and Spencer (2008)	Quantitative and Qualitative Analysis in Social Sciences	0
45	Lettau, Ludvigson and Wachter, J.(2008)	The Review of Financial Studies	4
46	Yogo (2008)	Journal of Business and Economic Statistics	3
47	Campbell and Thompson (2008)	The Review of Financial Studies	4
48	Campbell (2008)	Canadian Journal of Economics	3
49	Devaney (2008)	Journal of Financial Planning	0
50	Kanas (2009)	Journal of Economics and Finance	2
51	Tristani (2009)	Journal of Money, Credit and Banking	3
52	Smith, Sorensen and Wickens (2010)	International Journal of Finance and Economics	2
53	Kanas (2010)	Journal of Economics and Finance	2
54	Jermann (2010)	Journal of Financial Economics	4
55	Rapach, Strauss and Zhou (2010)	The Review of Financial Studies	4

56	Routledge and Zin (2010)	The Journal of Finance	4
57	Santa Clara and Yan (2010)	The Review of Economics and Statistics	0
58	Appelbaum and Basu (2010)	Annals of Operation Research	3
59	Donaldson et al (2010)	Journal of Financial and Quantitative Analysis	4
60	Bhar and Malliaris (2011)	Review of Behavioral Finance	0
61	Bollerslev and Todorov (2011)	The Journal of Finance	4
62	Julliard and Ghosh (2012)	The Review of Financial Studies	4
63	Gabaix (2012)	The Quarterly Journal of Economics	4
64	Mehra and Prescott (1985)	Journal of Monetary Economics	4

Appendix B -Quality Assessment Scores

Quality Score for Empirical Papers											
Paper No.	Quality Scores										Average Score
	A	B	C	D	E	F	G	H	I	J	
1	4	3	3	5	5	3	4	4	3	5	3.9
2	5	5	3	4	3	3	5	3	3	3	3.7
3	4	3	4	5	4	5	5	5	4	5	4.4
4	4	3	5	3	5	3	5	3	4	3	3.8
5	5	4	5	3	5	5	4	3	4	4	4.2
6	5	5	5	4	5	3	4	5	4	3	4.3
7	4	3	5	4	5	4	5	4	5	4	4.3
8	5	5	5	3	4	3	4	4	4	4	4.1
9	3	5	3	4	4	5	3	5	4	3	3.9
10	5	4	4	4	4	3	4	5	4	5	4.2
11	4	5	5	4	3	5	5	3	5	5	4.4
12	3	4	4	5	3	3	4	4	3	3	3.6
13	3	4	3	4	4	5	3	4	4	3	3.7
14	3	5	5	3	5	3	4	5	5	3	4.1
15	4	5	3	3	4	3	5	5	5	3	4
16	3	5	3	5	5	4	4	5	3	4	4.1
17	3	3	5	4	4	3	4	4	3	5	3.8
18	3	4	3	3	4	3	3	4	4	5	3.6
19	4	5	5	3	5	5	4	3	3	5	4.2
20	4	3	5	4	5	5	3	3	4	3	3.9
21	5	4	4	4	4	4	3	3	4	3	3.8
22	4	5	5	5	3	4	4	4	3	3	4
23	3	3	4	5	3	5	4	4	3	5	3.9
24	3	5	3	3	3	4	3	5	3	3	3.5
25	5	5	3	4	3	4	3	3	5	4	3.9
26	3	4	4	5	4	5	4	4	3	5	4.1
27	3	4	5	5	4	3	4	4	5	3	4
28	5	3	3	4	3	5	5	4	4	3	3.9
29	5	5	4	3	4	3	4	3	4	4	3.9
30	5	4	3	4	5	3	4	5	5	4	4.2
31	3	4	3	5	4	5	3	3	4	4	3.8
32	3	4	4	5	4	3	5	5	5	3	4.1
33	3	3	4	5	4	3	5	4	4	3	3.8
34	3	5	4	3	3	3	3	5	5	5	3.9
35	3	4	5	5	5	5	3	4	5	3	4.2
36	5	5	3	5	3	4	3	3	3	4	3.8
37	5	4	4	4	3	5	5	3	5	5	4.3
38	4	5	3	3	4	3	4	4	3	5	3.8

39	4	5	4	5	3	4	3	4	3	4	3.9
40	3	3	3	3	3	5	3	5	4	4	3.6
41	4	4	3	5	3	4	4	3	4	3	3.7
42	3	3	4	4	3	3	3	4	4	3	3.4
43	5	4	5	5	3	5	4	5	5	5	4.6
44	4	3	4	5	3	3	4	5	3	3	3.7
45	4	3	5	3	4	4	3	3	3	4	3.6
46	3	3	3	5	4	5	3	5	4	4	3.9
47	5	3	5	5	3	5	3	5	3	5	4.2
48	3	4	4	5	3	5	4	5	4	4	4.1
49	4	5	4	4	4	5	3	4	5	5	4.3
50	3	4	5	5	4	3	3	4	3	3	3.7
51	5	5	4	5	3	3	3	3	3	5	3.9
52	4	3	4	4	4	4	3	5	4	4	3.9
53	5	4	3	4	4	5	4	5	5	5	4.4
54	4	4	3	4	5	3	5	5	3	5	4.1
55	3	4	3	3	5	4	4	3	3	5	3.7
56	3	4	5	3	5	3	5	5	4	5	4.2
58	4	5	3	3	4	4	3	4	3	4	3.7
59	3	3	5	4	4	4	3	4	3	3	3.6
60	5	4	5	5	3	3	4	3	4	4	4
61	3	4	4	5	3	5	4	3	5	5	4.1
63	3	4	5	3	4	5	3	5	4	4	4
64	4	3	5	5	3	5	4	4	5	3	4.1

Quality Score for Conceptual Papers							
Paper No.	Quality Scores						Average Score
	A	B	C	D	E	F	
57	5	4	3	3	3	4	3.7
62	3	4	3	4	3	5	3.7

Note: Paper No. in the above Quality Assessment Scores table refers to the paper number in the data extraction form.

Appendix C - Individual Data Extraction Sheets

Paper No.	1 (Empirical)
Journal Ranking	3*
Citation	
Title	<u>A New Methodology for Studying the Equity Premium</u>
Author	Appelbaum E. and Basu P.
Journal	Annals of Operations Research
Keyword	Equity Premium, estimation, moments
Year, Vol. (No.)	2010, 176 (1)
Study Background	
Research Question	Why the equity premium is so volatile while the process of consumption is smooth.
Data Description	Annual US Data
Time Period	1929-2001
Methodology	
Variables	
Model(s) used	Dual indirect utility function as opposed to primal utility function which is predominantly used in standard CCAPM
Economy	US (Developed Market)
Contribution and Synthesis	
Theoretical	The article estimates functions for consumption and ERP independent of each other using non-parametric technique. Both the functions are of first and second order moments of state variables. Both the function does not require any explicit form of utility function and is applicable in non-expected utility space.
Empirical	The functions reasonably explain smooth consumption pattern and high mean and volatility of ERP in the US for the period 1929-2001
Paper No.	2 (Empirical)
Journal Ranking	4*
Citation	
Title	<u>A Comprehensive Look at the Empirical Performance of Equity Premium Prediction</u>
Author	Goyal, A., and Welch I.
Journal	The Review of Financial Studies
Year, Vol. (No.)	2008. 21(4)
Keywords	models of ERP, macroeconomic variables
Study Background	
Research Question	Is there any empirical evidence to show that the variables used by different economist in the literature, up until 2006, can predict ERP?
Data Description	Monthly and annual US data
Time Period	1871-2005
Methodology	
Variables	Three groups of explanatory variables are used. 1) Stock specific: contains 10 explanatory variables. 2) Interest-specific variables: contains 7 variables. 3) Macroeconomic Variables: 5 variables are used
Model(s) used	Simple linear regression models

Economy	US (Developed Market)
Contribution/Synthesis	
Theoretical	NA
Empirical	The different liner models used in the article that uses the above sets of explanatory variables do not have significant predictive power on ERP both in in sample and out of sample

Paper No.	3 (Empirical)
Journal Ranking	No Ranking
Citation	
Title	Will Future Equity Risk Premium Decline?
Author	Devaney, M.
Journal	Journal of International Economics
Year, Vol. (No.)	2008. 21(4)
Keywords	time varying, ERR
Study Background	
Research Question	Will the ERP in the US change in the future?
Data Description	annual US data
Time Period	1870-2002
Methodology	
Variables	Returns on S&P 500 and ten year T bonds, population demographic, monetary policy, dividend policy, productivity growth and composition of industrial output
Model(s) used	Simple linear regression models
Economy	US (Developed Market)
Contribution and Synthesis	
Theoretical	NA
Empirical	The model shows that the explanatory power of the variables has changed over time. The effect of macroeconomic factors was more predominant in the pre-war period than the post-war period. Population growth rate is shown to have insignificant impact on ERP.

Paper No.	4 (Empirical)
Journal Ranking	4*
Citation	
Title	Variable Rare Disaster: An Exactly Solved Framework for Ten Puzzles in Macro-Finance
Author	Gabaix, X.
Journal	The Quarterly Journal of Economics
Year, Vol. (No.)	2012, 127 (2)
Study Background	
Research Question	Does rare disaster model explain the asset pricing puzzles in macro-finance?
Data Description	US monthly data on 1 year and 5 year nominal bonds
Time Period	1952-2007 for bonds. Stock market data 1891-1991 from Campbell (2003)

Methodology	
Variables	
Model(s) used	Power utility model for asset pricing issues and Epstein-Zin model for studying the impact of movements in disaster probability. The author uses Linearity Generating processes.
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	Variable rare disaster model helps to explain various asset pricing anomalies in finance and macroeconomics including the ERP puzzle. The time varying severity of rare disaster events explains the time varying nature of ERP. More resilient stocks (assets that perform better in disaster events) have lower ex ante risk premium. The disaster model also implies that the covariance of stock prices with consumption is high during disaster events thus explaining the ERP puzzle.
Empirical	ERP conditional to no disaster event is 6.5%. Unconditional ERP is 5.3%

Paper No.	5 (Empirical)
Journal Ranking	4*
Citation	
Title	Rare Disasters and Asset Market in the Twentieth Century
Author	Barrow R.
Journal	The Quarterly Journal of Economics
Year, Vol. (No.), pp.	2006, 121(3), 823-866
Study Background	
Research Question	Can rare disaster events explain ERP?
Data Description	
Time Period	1890-2004 Annual data for G7 countries
Methodology	
Variables	
Model(s) used	Lucas (1978), Mehra and Prescott (1985) and Reitz (1988). Expected Utility models with disaster states. Representative agent, fruit-tree model, with exogenous stochastic production.
Economy	G7 countries (Developed economies)
Contribution	
Theoretical	Model to explain why ERP is unusually high using rare disaster events WW1, WW2 and The Great Depression
Empirical	1) Disaster probability 1.5-2% per year with decline in per capita GDP between 15%-64%. Explains why the real interest rates in the US were very low during these disaster events.
	2) ERP depends on debt/equity ratio. If the risk aversion coefficient is 4 and the probability of disaster is 1.17%, then ERP is 7.2% with debt/equity ratio of 1 and with no leverage the ERP is 3.6% with same disaster probability.
	3) ERP is nearly proportional to the disaster probability; however the strength of this relationship depends on risk aversion coefficient.
	4) ERP also depends on contingent probability of default. A lower value of this probability means T-bills are safer than equities in the event of disaster and hence higher ERP.

Paper No.	6 (Empirical)
Journal Ranking	4*
Citation	
Title	<u>Can Rare Events Explain the Equity Premium Puzzle?</u>
Author	Julliard, C. and Ghosh A.
Journal	The Review of Financial Studies
Year, Vol. (No.) pp	2012, 25, (10), 3037-3076
Keywords	rare events, equity premium, puzzle, international ERP
Study Background	
Research Question	Can rare events /historic data on economic disaster in the US and international data rationalise the existence of ERP puzzle?
Data Description	Two types of Annual and quarterly US data. Consumption and Stock market data of the UK for the longer period. Post war data samples on 7 OECD countries
Time Period	1890-2009 and 1929-2009
Methodology	
Variables	Return on Value weighted index on NYSE, AMEX and NASDAQ. R_f = One month treasury bill returns, annual per capita real consumption of non-durables, for longer period, return on S&P 500 as market return and commercial paper rates as R_f
Model(s) used	Generalise Empirical Likelihood family models. More Robust than traditional GMM models. Bayesian posterior inference (Bayesian Exponentially Tilted Empirical Likelihood. CRRA utility function
Economy	US and 8 OECD countries (Developed markets)
Contribution and Synthesis	
Theoretical	1) By allowing the probabilities attached to the states of the economy to change, the authors have estimated the Euler's equation for ERP using information-theoretic approach and showed that CCAPM is still rejected and requires high level of RRA.
Empirical	1) Disaster data in the World financial market do not support the the hypothesis that these events can explain the ERP puzzle, unless it can be believed that disasters happens every 6-10 years.
	2) If unusually high ERP is to be explained by rare events, than the unusually high ERP itself is rare event.
	3) To explain the ERP puzzle, which originated using CCAPM, higher probabilities are needed to be attached to disaster events.
	Overall, rare events hypothesis/model does not support the ERP puzzle i.e. ERP is not affected by rare events or rare events do not cause ERP. If rare/disaster events explain the ERP puzzle than the likelihood of the recessions and market crashes has to be increased by 4%-6% than what it is actually found in the data.

Paper No.	7 (Empirical)
Journal Ranking	4*
Citation	
Title	<u>The Equity Risk Premium: A solution</u>
Author	Rietz, T
Journal	Journal of Monetary Economics

Year, Vol. (No.) pp.	1988, 22 (1), 117-131
Keywords	equity premium, disaster events.
Study Background	
Research Question	Can ERP be explained by incorporating low probability depression-like event in the standard CRRA preference and CCAPM used by Mehra and Prescott (1985)?
Data Description	Same as Mehra and Prescott (1985)
Time Period	Same as Mehra and Prescott (1985)
Methodology	
Variables	per capita consumption, return on S&P 500 index, 3-months T-bill rates
Model(s) used	CRRA power utility function and CCAPM with the introduction of third state of economy (crash state) having very low probability
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	By incorporating a third (crash-like state) of the economy in the standard Mehra and Prescott (1985) model of general equilibrium, the author showed that ERP puzzle can be resolved i.e. ERP is caused because of low probability of market crash-like scenarios.
Empirical	The risk aversion parameter decreases as the probability of the crash state increases while maintaining the subjective discount factor between 0 and 1 by considering various scenarios of output during crash states as a fraction of output during normal states.

Paper No.	8 (Empirical)
Journal Ranking	2*
Citation	
Title	Crash states and the equity premium: Solving one puzzle raises another
Author	Salyer, D
Journal	Journal of Economic Dynamics and Control
Year, Vol. (No.) pp.	1998, 22(6), 955-965
Keywords	crash states, equity premium
Study Background	
Research Question	Can the introduction of low probability catastrophic state in the CCAPM explains unusually high ERP?
Data Description	Same as in Rietz (1988) and Mehra and Prescott (1985)
Time Period	1889-1978
Methodology	
Variables	Same as in Rietz (1988)
Model(s) used	Same as in Rietz (1988)
Economy	US (developed)
Contribution and Synthesis	
Theoretical	Inclusion of low probability crash state in CCAPM helps to match the first moment (mean) of the ERP with the actual data however the second moment (standard deviation) of the excess returns be explained by CCAPM with a crash state.

Empirical	The slope of Hansen and Jagannathan (1991) frontier (price of risk) in crash state condition consistent with unconditional ERP is 2.5 times the actual observed, which shows that standard deviation of ERP cannot be matched with the actual data by introduction of crash state
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Paper No.	9 (Empirical)
Journal Ranking	4* (ABS Journal Ranking March 2010)
Citation	
Title	Crashes, Volatility and the Equity Premium: Lessons from S&P 500 Options
Author	Santa-Clara P. and Yan S.
Journal	The Review of Economics and Statistics
Year, Vol. (No.) pp.	2010, 92(2), 435-451
Keywords	equity premium, disaster events, crash states
Study Background	
Research Question	What is the impact of jump risk and stochastic volatility on ex ante ERP implied by options prices?
Data Description	S&P 500 options
Time Period	Jan 1996- Dec 2002
Methodology	
Variables	Prices of S&P 500 options, T-Bill rate, spread on bank commercial paper over T-Bills, Spread of High Yield bonds over T-Bills.
Model(s) used	Jump Diffusion model. Regression of option implied ERP on three crash-state variables. CRRA utility to derive equilibrium ERP of a representative agent. Stock market dynamics is modelled using two types of risk, diffusive risk captured by Brownian Motion and jump risk captured by Poisson process.
Economy	US (developed)
Contribution and Synthesis	
Theoretical	1) The models support the crash/rare events hypothesis which explains high ERP.
	2) ERP is a function of stochastic (diffusive) volatility and jump risk.
Empirical	1) Ex ante ERP varies between 0.3% to 54% per annum
	2) During crises, jump risk commands between 45.5% to 100% of the ERP
	3) Average ex ante ERP implied by option prices is 11.8% while the ex post/actual ERP is 6.8% for realised volatility. Thus the required compensation is 70% higher than what is actually realised.
	4) Regression of option implied ERP on the above three variables shows a significant relation between crash events, as implied by the three variables, and the option implied ERP.

Paper No.	10 (Empirical)
Journal Ranking	4*
Citation	
Title	Predicting Returns in the Stock and the Bond Markets
Author	Keim D. and Stambaugh R.
Journal	Journal of Financial Economics
Year, Vol. (No.) pp.	1986, 17(2), 357-390
Keywords	equity premium, time varying
Study Background	
Research Question	Are there ex ante observable variables that reliably predict ex post risk premiums defined as rates of return in excess of short-term interest rate?
Data Description	Monthly data of the returns on S&P 500, rolling 45 years annual return on S&P 500, monthly data on bond market returns
Time Period	1928-1978
Methodology	
Variables	returns on S&P 500 index, return on fifth, third and first quintiles of NYSE, return on BAA rate long term corporate bonds, return on long term corporate bonds below BAA rated, Long term high grade bonds, and Long term government bonds, 1 month treasury bills yield, spread between under-rated bond and T-bills yields.
Model(s) used	Regression of risk premiums of the 7 asset classes on the three main variables (Yub-Ytb), (ln(SP/aSP) and (ln(Psmall))).
Economy	US (developed)
Contribution and Synthesis	
Theoretical	NA
Empirical	1) Expected risk premiums change over time and levels of asset prices contains the information about the expected premiums
	2) The equity premium, as calculated on fifth, third and first quintile of NYSE stocks using 1-month T-bills are affected by three predictor variables namely spread between the yields of under-rated corporate bonds and T-bills, log ratio of real S&P index to its previous 45 years average and log of share price of smallest market capitalisation firms on NYSE.
	3) Nearly 32% variance in the equity premium of small cap firms can be explained by January effect
	4) Level of small stock prices may provide a sensitive ex ante barometer of expected future premiums.

Paper No.	11 (Empirical)
Journal Ranking	4*
Citation	
Title	Tails, Fears, and Risk Premia
Author	Bollerslev T. and Todorov V.
Journal	The Journal of Finance
Year, Vol. (No.) pp.	2011, 66(6), 2165-2211
Keywords	Cross Reference

Study Background	
Research Question	What is the impact of financial crash on risk premia?
Data Description	Intraday High Frequency data and short maturity out-of money S&P 500 options for the period 1996-2008. Prices of S&P 500 futures at 5min interval
Time Period	1990-2008
Methodology	
Variables	Prices of S&P 500 futures (1990-2008), closing prices of all S&P 500 options (1996-2008), implied volatilities
Model(s) used	Extreme Value Theory, non-parametric estimation of "medium" sized jumps in high frequency intraday returns
Economy	US (developed)
Contribution	
Theoretical	NA
Empirical	1) On average close to 5% of equity premium may be attributed to the compensation for rare disaster events.
	2) the jump intensity for negative jumps of more than or equal to -20% is 12 times more than the jump intensities for positive jumps of more than or equal to 20%, implying that investors are compensated more for the negative outcomes than for positive outcomes in a risk-neutral situation.
	3) Large positive jumps also carry a premium although less than negative jumps.
	4) Most of the contribution to ERP comes negative jump intensities caused due to specific economic events in the 1990s and 2000s, like October 1997 mini crash, Russian default of 1998, LTCM failure of 1998, 9/11 attacks of 2001 and Lehman collapse of October 2008.

Paper No.	12 (Empirical)
Journal Ranking	3*
Citation	
Title	Estimating the Equity Premium
Author	Freeman M.C. and Davidson I.R.
Journal	The European Journal of Finance
Year, Vol. (No.) pp.	1999, 5(3), 236-246
Keywords	equity premium, equity premium puzzle, estimating
Study Background	
Research Question	What are the problems that arise while determining the equity premium and what problems may arise if one uses observed (ex post) values of excess returns as a proxy of future expectations?
Data Description	NA
Time Period	NA
Methodology	
Variables	NA
Model(s) used	CCAPM with isoelastic additive utility function to estimate ex ante ERP.
Economy	UK and USA
Contribution	

Theoretical	1) There are mutually exclusive problems in estimating ex ante and ex post measures of ERP.
	2) Standard CCAPM with CRRA utility function under-estimates ERP with the one estimated by the ex post or the realised measure by a factor of 10
	3) Ex post measures of ERP cannot be unbiased estimate of ex ante ERP
	4) Modifications to the preference structures in the expected utility function used in CCAPM may bring ex ante estimates close to ex post, however not equal to ex post measures
Empirical	NA

Paper No.	13 (Empirical)
Journal Ranking	4*
Citation	
Title	Estimating the Market Risk Premium
Author	Mayfield E.S.
Journal	Journal of Financial Economics
Year, Vol. (No.) pp.	2004, 73(3), 465-496
Keywords	equity premium, estimating, risk premium
Study Background	
Research Question	
Data Description	monthly value weighted excess returns on NYSE, Amex and NASDAQ
Time Period	1926-2000
Methodology	
Variables	monthly ERP, using 1 month T-bills
Model(s) used	Two states (low and high volatility states) Markov switching models of whose parameters are estimated using Hamilton (1989), the expression for equilibrium ERP is based on continuous time, representative agent with preferences described by power utility.
Economy	US (developed)
Contribution and Synthesis	
Theoretical	NA
Empirical	1) In low volatility state, the annual standard deviation of the returns is 13% with mean ERP 12.4%
	2) In high volatility state, the annual standard deviation of the returns is 38.2% with mean ERP -17.9%
	3) More than half of the ex post ERP is attributable to risk of future changes in the level of market volatility.
	4) Ex-post post excess returns are not unbiased estimates of ex ante returns following the 1930s.

Paper No.	14 (Empirical)
Journal Ranking	4*
Citation	
Title	Estimating the Market Risk Premium
Author	Donaldson G. R, Kamstra M. and Kramer L.
Journal	Journal of Financial and Quantitative Analysis
Year, Vol. (No.) pp.	2010, 45(4), 813-846
Keywords	equity premium, estimating, risk premium
Study Background	
Research Question	1) What is the probability that the US could randomly produce an ex post ERP of 6%
	2) What is the probability that we would observe the various combinations of key financial statistics that have been realised in the US such as Sharp Ratio, low dividend yields, high return volatility and a high ex post ERP ?
Data Description	Annual data return on S&P 500 and 1 year T-bills.
Time Period	1952-2004
Methodology	
Variables	dividend yields, S&P 500 monthly returns, 1-year T-bills rate, dividend growth rates. Sharp Ratio, standard deviation of excess market return, mean of dividend yield, mean of ex post ERP
Model(s) used	Simulated Method of Moments, the base model was estimated using AR(1) for interest rate process, MA(1) for dividend growth rates and AR(1) model for ex ante ERP (unconditional ERP). 11 forms of the base model was used to estimate ex ante ERP
Economy	US (developed)
Contribution and Synthesis	
Theoretical	NA
Empirical	1) The simulated moments of ERP, interest rate and dividend growth rates in the simulation broadly matches with the actual US data over the time period.
	2) Results suggests a range of 2.75% - 8% of ERP which is consistent with the US data over the sampling period
	3) The range of unconditional ERP is very close to 3.5% for the US.
	4) By incorporating structural breaks, autocorrelation and gradual downward trend in the ERP in the system of equations, which estimate the evolution of the process for interest rate, dividend growth rates and ex-post ERP, the authors have shown that simple AR(1) models to estimate ex ante ERP is not sufficient enough to generate precise estimates of ERP.
	5) The authors have introduced 11 types of complexities in the base system of equations.

Paper No.	15 (Empirical)
Journal Ranking	4*
Citation	
Title	The Equity Premium and Structural Breaks
Author	Pastor L and Stambaugh R.
Journal	The Journal of Finance
Year, Vol. (No.) pp.	2001, 56(4), 1207-1239
Keywords	equity premium, estimating, risk premium , time varying
Study Background	
Research Question	
Data Description	Monthly data on equity return series and risk free interest rate.
Time Period	January 1834- June 1999
Methodology	
Variables	value weighted portfolio of NYSE stocks for the period (1926-199), for the period 1863-1870, the return series is based on railroad stocks, for the period of 1834-1862, the return series is based on stocks of financial firms. For the period 1885-1925, the return series is based on DJI stocks and railroad stocks. For the period 1926-1999, the risk free rate is one month T-bill rate, for the period 1920-1925, 3-month T-bills rate, and all the data on risk free rate before 1920 is based on commercial paper
Model(s) used	Bayesian models
Economy	US (developed)
Contribution and Synthesis	
Theoretical	The introduction of transition regimes in the statistical models to estimate the ERP is appealing
Empirical	1) Changes in the ERP across time are unlikely to be extreme.
	2) Across the sub-periods and in the presence of structural breaks, ERP is positively associated volatility of the return series.
	3) Estimates of ERP for the entire period is in the range of 3.9% - 6%.
	4) The estimated ERP for the much of the 19th century and the first decade of 20th century is increases till 1930s after which it has steadily declined with few spikes in the 1970s.
	5) The sharpest decline in the ERP comes in 1990s to 4.8%
	6) Without transition regimes the estimates of ERP increase from 6.2% to 6.8% in the 1990s whereas by introducing the transition regimes in the same period the ERP estimates decreases from 6.5% to 5.9%.

Paper No.	16 (Empirical)
Journal Ranking	4*
Citation	
Title	Equity Premia as low as Three per cent? Evidence from Analyst's Earnings Forecasts for Domestic and International Stock Market
Author	Claus J. and Thomas J
Journal	The Journal of Finance

Year, Vol. (No.) pp.	2001, 56(5), 1629-1666
Keywords	equity premium, estimating, risk premium
Study Background	
Research Question	Is 8% ERP (as estimated by Ibbotson Associates and most commonly used proxy of equity premium in the US) in the US too high, in recent years?
Data Description	Annual firm level data for the period 1985-1998 in the US and other 4 major markets.
Time Period	1985-1998
Methodology	
Variables	earnings, dividends, dividend pay-out ratio, book value, market value, outstanding shares, share prices of the firms in the prior fiscal year, rate on 10-year T- bonds as risk free rate, equity premium is the difference between the estimated discount rate that comes from discounting the future abnormal earnings and 10 year Government bond rate.
Model(s) used	abnormal earnings model
Economy	US , Canada, France, Germany, UK and Japan
Contribution and Synthesis	
Theoretical	NA
Empirical	1) The ERP estimates post 1985 is no more than 3% in 6 major stock markets,

Paper No.	17 (Empirical)
Journal Ranking	4*
Citation	
Title	The Equity Premium
Author	Fama E and French K
Journal	The Journal of Finance
Year, Vol. (No.) pp.	2002, 57(2), 637-659
Keywords	equity premium, estimating, risk premium
Study Background	
Research Question	How to estimate unconditional expected stock returns using the two models mentioned below and then using that how to estimate unconditional expected ERP?
	Why the expected return estimates for the period 1951-2000 from fundamentals is much lower than the realised average return?
Data Description	Annual US data
Time Period	1872-2000
Methodology	
Variables	realised dividends, realised earnings, dividend-price ratio, earnings-price ratio, returns on S&P 500, PPI, CPI, risk free rate is the annual 6-month commercial paper rate, book-equity ratio of S&P 500 index, growth rates in dividends, earnings and prices of S&P 500 index, real dividend yield and earnings yields, sharp ratio of dividends, earnings and ERP.
Model(s) used	Dividend growth models, earnings growth model
Economy	US
Contribution and Synthesis	

Theoretical	
Empirical	1) The estimate of expected ERP (unconditional) using the dividend growth model for the period 1872-2000 is 3.54% (real)
	2) The estimate of ERP using dividend growth model for the period 1872-1950 is 4.17%, which is very close to the actual ERP for the same period of 4.4%
	3) The ERP estimate using the dividend model for the period 1951-2000 is 2.55% whereas the actual estimate for the same period is 7.43%
	4) The estimate of expected ERP from the earnings growth model for the period 1951-2000 is 4.32% which is far greater than that produced by the dividend model (2.55%), but it is 60% smaller than the actual estimate of ERP.
	5) The decline in the price ratio is mostly due to decline in the expected returns.
	6) Replacing the 6-month commercial paper rates by One-month T-bill rate, as the risk-free rate, increases the ERP by 1% for the period 1951-2000
	7) The Sharp ratio of ERP from the dividend model for the period 1872-1950 is 0.22, very close to the actual Sharp Ratio of the ERP using the actual returns (0.23)
	8) The same Sharp Ratio for the period 1951-2000 is 0.15
	9) The Sharp Ratio of ERP for the period 1951-2000 by earning growth model is 0.25

Paper No.	18 (Empirical)
Journal Ranking	No Ranking
Citation	
Title	The Long-run Equity Risk Premium
Author	Graham J and Harvey C
Journal	Finance Research Letters
Year, Vol. (No.) pp.	2005, 2(4), 185-194
Keywords	equity premium, estimating, risk premium
Study Background	
Research Question	
Data Description	Quarterly survey data of Chief Financial Officers. 5014 responses over the period of time
Time Period	June 2000 - June 2005
Methodology	
Variables	Return on S&P 500, risk free rate is 10 year US government bond.
Model(s) used	Survey based study
Economy	US (Developed)
Contribution	
Theoretical	
Empirical	1) Lowest ERP was 2.88%, whereas highest was 4.65%
	2) Implied ERP was 2.98%
	3) There is no correlation between past returns and the level of long-run risk premium.
	4) Long-run ERP and real interest rates move together

	5) There is a positive correlation between market volatility, as implied by S&P 500 index options, and long-term ERP. (0.44)
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Paper No.	19 (Empirical)
Journal Ranking	3*
Citation	
Title	Estimating the Equity Risk Premium using Accounting Fundamentals
Author	O'Hanlon J and Steele A.
Journal	Journal of Business Finance and Accounting
Year, Vol. (No.) pp.	2000, 27 (9&10), 1051-1083
Keywords	equity premium, estimating, risk premium
Study Background	
Research Question	How to estimate ERP by using cost of equity capital in the UK?
Data Description	accounting data on 172 UK companies (part of FT actuary's All share Index at January 1981)
Time Period	1968-1995
Methodology	
Variables	abnormal earnings (accounting earnings minus the cost of equity times the previous year's book value of equity, dividends, cost of equity, Ordinary Profits (accounting earnings less preferred dividends, return on equity, yield on 3-month UK T-bills as risk-free rate.
Model(s) used	ERP is estimated as the slope of the regression plot of company-specific cost of equity estimates and their respective CAPM betas. Linear regression model
Economy	UK(Developed)
Contribution	
Theoretical	
Empirical	1) ERP estimated using the time series data of company's profitability and time series of company's unrecorded goodwill, has been around 5% (Range 4% -6%) in the UK.
	2) Ex ante ERP, measured by above methodology (5%), is substantially lower than the historical realised average ERP.

Paper No.	20 (Empirical)
Journal Ranking	No Rank
Citation	
Title	Views of Financial Economists on the Equity Premium and on Professional Controversies
Author	Welch I
Journal	The Journal of Business
Year, Vol. (No.) pp.	2000, 73(4), 501-537
Keywords	equity premium, estimating, risk premium, time varying
Study Background	
Research Question	What are the meta-estimates of equity premium in the view of Financial Economist?

Data Description	Survey was posted on the author's website, the printed copy was posted to finance professors at 11 universities in the US
Time Period	October 1997- May 1999
Methodology	
Variables	NA
Model(s) used	Survey of 226 Financial Economists
Economy	US
Contribution and Synthesis	
Theoretical	NA
Empirical	1) Arithmetic ERP over 10 and 30 years horizon is 7%
	2) Arithmetic ERP over 1 and 6 years horizon is 6% - 7%
	3) The pessimistic estimate over 30 year horizon is 2% - 3% while the optimistic estimate over the same horizon is 12% -13%
	4) The 100-year average estimate of ERP, according to 45 respondents, was 6.5%
	5) There is a term structure of equity premium. Short term forecasts were lower than long term forecasts

Paper No.	21 (Empirical)
Journal Ranking	2*
Citation	
Title	Myopic Loss Aversion, Disappointment Aversion and the Equity Premium Puzzle
Author	Fielding D. and Stracca L
Journal	Journal of Economic Behaviour and Organisation
Year, Vol. (No.) pp.	2007, 64(2), 250-268
Keywords	Myopic loss aversion; Disappointment aversion; Equity premium puzzle
Study Background	
Research Question	1) How myopic do agents have to be for a large equity premium?
	2) What time horizons reasonable parameters for the degree of disappointment aversion can explain historical equity premium?
Data Description	annual US data
Time Period	1871-2001
Methodology	
Variables	return on S&P 500, 1-year T-bill as risk free rate,
Model(s) used	linear loss aversion function, a special case of Benartzi and Thaler (1995), value function defined on excess returns,
Economy	US (developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) Loss aversion require extreme myopia. A period of 3 years or so seems too long enough to explain the historic ERP.
	2) Disappointment aversion seems to be a plausible explanation of ERP even on longer time horizons of 10 years.
	3) Disappointment aversion is better explanation of ERP than loss aversion because it can accommodate different time horizons

Paper No.	22 (Empirical)
Journal Ranking	4*
Citation	
Title	Myopic loss aversion and the Equity Premium Puzzle
Author	Benartzi S and Thaler R.
Journal	The Quarterly Journal of Economics
Year, Vol. (No.) pp.	1995, 110(1), 73-92
Keywords	Myopic loss aversion; Equity premium puzzle
Study Background	
Research Question	Can myopic loss aversion explain the ERP puzzle?
	How often the investors have to evaluate the performance of their portfolio in order for them to be indifferent between investing in stocks and risk-free bonds?
	How often the investors have to evaluate the performance of their portfolio, having prospect theory utility, to explain equity premium?
	By how much the equity premium falls is the evaluation period is increased?
Data Description	monthly return in the US
Time Period	1926-1990
Methodology	
Variables	Monthly returns on stocks return on 5-year bond and T-bills.
Model(s) used	Kahneman and Tversky (1979, 1992) prospect theory, utility function defined over gains and losses, simulations of the prospect theory utility.
Economy	US (developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) For nominal returns the equilibrium evaluation period is 13 months and for real returns it is between 10-11 months
	2) One year evaluation period is quite plausible.
	3) Loss aversion is main driving factor of equity premium. The loss aversion factor corresponding to evaluation period of one year is 2.77
	4) At one year evaluation period, the proportion allocated to stocks varies between 30% - 55%, i.e. at this proportion the prospective utility is maximum.
	5) Equity premium is caused because of combination of loss aversion and frequent evaluation.

Paper No.	23 (Empirical)
Journal Ranking	4*
Citation	
Title	Why stocks may disappoint?
Author	Ang A., Bekaert G., Liu J.
Journal	Journal of Financial Economics
Year, Vol. (No.) pp.	2005, 76(3), 471-508
Keywords	loss aversion; Equity premium puzzle

Study Background	
Research Question	Can disappointment aversion be a best alternative to loss aversion and thereby better explain equity premium?
Data Description	quarterly data on US stock returns and T-bills
Time Period	1926-1998
Methodology	
Variables	Stock returns (not clearly mentioned which market index used), T-bills (not mentioned which maturity bills)
Model(s) used	Disappointment aversion preference as in Gul (1991), DA utility is defined over wealth
Economy	US (developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) Disappointment aversion causes equity premium
	2) High enough DA leads to non-participation in stock market.
	3) The critical value of DA coefficient that matches the historic equity premium of 6.55% in the US is 0.37.
	4) As expected equity premium increase, the non-participation DA coefficient decreases
	5) Despite large equity premium, stocks may disappoint!

Paper No.	24 (Empirical)
Journal Ranking	4*
Citation	
Title	Prospect Theory and Asset Prices
Author	Barberis N., Huang M. and Santos T.
Journal	The Quarterly Journal of Economics
Year, Vol. (No.) pp.	2001, 116(1), 1-53
Keywords	loss aversion; Equity premium puzzle
Study Background	
Research Question	Can loss aversion and prior outcomes of explain equity premium?
Data Description	Annual US data
Time Period	1926-1995
Methodology	
Variables	returns on NYSE stocks, T-bills as risk free rate, price-dividend ratio
Model(s) used	expected utility defined over consumption and changes in financial wealth
Economy	US (developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) The model produces substantial equity premium.
	2) Loss aversion can cause higher ERP
	3) Prior outcomes i.e. prior losses and gains have impact on equity premium.

	4) Prior losses makes future losses more painful and hence demand more premium, however prior gains make future losses less painful high risk aversion does not increase dramatically.

Paper No.	25 (Empirical)
Journal Ranking	4*
Citation	
Title	Generalised Disappointment Aversion and Asset Prices
Author	Routledge B and Zin S.
Journal	The Journal of Finance
Year, Vol. (No.) pp.	2010, 55(4), 1303-1332
Keywords	Myopic loss aversion; Disappointment aversion; Equity premium puzzle
Study Background	
Research Question	
Data Description	annual US data
Time Period	Same as Mehra and Prescott (1985)
Methodology	
Variables	Same as Mehra and Prescott (1985)
Model(s) used	Utility with disappointment preferences of Gul (1991).
Economy	US (developed)
Contribution and Synthesis	
Theoretical	1) Models with GDA can induce more risk aversion and match with actual asset return properties more than the normal DA and expected utility model
Empirical	1) GDA produces countercyclical risk aversion
	2) The GDA model also generate large ERP (5.12% and 12.65%)

Paper No.	26 (Theoretical)
Journal Ranking	4*
Citation	
Title	Habit Formation: A Resolution of Equity Premium Puzzle
Author	Constantinides G
Journal	Journal of Political Economy
Year, Vol. (No.) pp.	1990, 98(3) 519-543
Keywords	equity premium, habit formation, equity premium puzzle
Study Background	
Research Question	Can we explain the equity premium puzzle by relaxing the time-separability preferences in the rational expectation model and by considering existence of habit persistence?
Data Description	Annual US data
Time Period	1889-1978

Methodology	
Variables	Same as Mehra and Prescott (1985)
Model(s) used	habit persistence in rational expectation model i.e. the standard expected utility framework
Economy	US (developed)
Contribution and Synthesis	
Theoretical	1) Rational expectation model involving habit persistence can generate first two moments of equity premium, sufficiently large enough to match with the actual observed values.
Empirical	1) The model generates mean and variance of consumption growth process at relatively lesser value of RRA (2.81) to generate the actual observed ERP
	2) The model predicts that the subsistence level of consumption produced is about 80% of the consumption level

Paper No.	27 (Empirical)
Journal Ranking	4*
Citation	
Title	By force of Habit: A consumption-based explanation of Aggregate Stock Market Behaviour
Author	Campbell J and Cochrane J
Journal	Journal of Political Economy
Year, Vol. (No.) pp.	1999, 107(25), 205-251
Keywords	equity premium, habit formation, equity premium puzzle
Study Background	
Research Question	Can slow-moving external habit formation in the standard power utility function help explain higher ERP with lower RRA?
Data Description	Annual US data, model simulated at monthly frequently
Time Period	1871-1993
Methodology	
Variables	Value weighted NYSE stock index returns, 3-months T-bill rates, per capita consumption of non-durables and services, S&P 500 index returns, commercial paper returns (1871-1993), Price/dividend ratio
Model(s) used	Independent and Identically Distributed (IID) consumption growth process (lognormal process) with the addition of slow moving external habit (trend) in the power utility function. In their model risk-free rate is held constant.
Economy	US (developed)
Contribution and Synthesis	
Theoretical	1) As current level consumption falls to time-varying habit level, the curvature of the utility function rises (risk aversion increases) and so the prices of risky assets fall and expected return rises
Empirical	1) The model produces, from artificial data, first two moments of risk-free rate, equity premium and price/dividend ratio that matches with the observed values.
	2) The model also produces low correlation of consumption with stock returns as observed in the actual data.
	3) The Sharp Ratio of conditional mean and standard deviation of ERP varies over time.

Paper No.	28 (Empirical)
Journal Ranking	4*
Citation	
Title	Asset Prices under Habit Formation and Catching up with the Joneses
Author	Abel, A.
Journal	American Economic Review
Year, Vol. (No.) pp.	1990, 80(2), 38-42
Keywords	equity premium, habit formation, equity premium puzzle
Study Background	
Research Question	(Implicit RQ): Can external habit formation in the time-separable utility function help to generate ERP?
Data Description	Annual US data, model simulated at monthly frequently
Time Period	Same as Mehra and Prescott (1985)
Methodology	
Variables	Same as Mehra and Prescott (1985)
Model(s) used	Time-separable external habit formation based utility function, IID consumption process.
Economy	US (developed)
Contribution and Synthesis	
Theoretical	1) Time separable external habit formation based utility function produces unconditional equity premium close to actual observed ERP.
Empirical	1) For low RRA of 1.14, the expected returns on stocks, bills and bonds are 38.28%, 0.93% and 35.16% respectively.

Paper No.	29(Empirical)
Journal Ranking	4*
Citation	
Title	Habit Formation: A Resolution of Equity Premium Puzzle?
Author	Otrok C, Rabikumar B, Whiteman C
Journal	Journal of Monetary Economics
Year, Vol. (No.) pp.	2002, 49 () 1261-1288
Keywords	equity premium, habit formation, equity premium puzzle
Study Background	
Research Question	How does habit formation simultaneously leads to higher ERP and lower risk-free rate with lower consumption volatility?
Data Description	Annual US data,
Time Period	1889-1992
Methodology	
Variables	Same as Mehra and Prescott(1985)
Model(s) used	spectral utility function defined over habit formation
Economy	US (developed)
Contribution and Synthesis	
Theoretical	1) Making consumption volatility less persistent in the spectral utility framework leads to increases in ERP

Empirical	1) The size of ERP is determined by relatively insignificant amount of short-term horizons volatility of consumption.
	2) Using the preference parameters in the model in such a way as to reproduce the actual ERP, they show a decline of 25% in the ERP and 16% in risk free rate.
	3) ERP rises by more than 1600bps even with constant consumption variance in AR(1) process for consumption growth
	4) With constant high frequency consumption variance the ERP decreases even though the overall volatility of consumption decreases for AR(1) consumption growth process
	5) In a low frequency consumption variance zone, with constant overall volatility, the ERP changes by 1800 bps.

Paper No.	30 (Empirical)
Journal Ranking	3*
Citation	
Title	Asset Prices under Habit Formation and Reference-Dependent Preferences
Author	Yogo M
Journal	Journal of Business and Economic Statistics
Year, Vol. (No.) pp.	2008, 26(2), 131-143
Keywords	equity premium, habit formation, equity premium puzzle, loss aversion
Study Background	
Research Question	Can habit based asset pricing model explain low real interest rates, high ERP and countercyclical variation in ERP?
Data Description	Quarterly US data
Time Period	1947-2004
Methodology	
Variables	per capita personal consumption expenditure, return on value-weighted NYSE stocks, one-month T- bill rate for calculating excess returns, 3-months T-bills as a proxy of risk free rate (not used in calculation of ERP), annual dividend/price ratio.
Model(s) used	Standard identical-agent economy with external habit formation and loss aversion in the utility function. "Gains and losses" are evaluated relative to habit. Habit is reference level which is geometric average of past consumption.
Economy	US (developed)
Contribution and Synthesis	
Theoretical	1) Loss aversion is important in explaining the level of ERP and habit formation is important in explaining the time variation in the ERP.
	2) Power utility has difficulty to explain household's behaviour towards large and small gambles
	3) Reference -dependent utility explains the above behaviour.
	4) Persistence in habit reduces volatility of risk-free rate across booms and busts whereas persistence of habit increases the volatility of risk free rate within the two states
Empirical	1) Linear reference-dependent utility is capable of explaining the actual ERP

	2) Even small fluctuations in consumption is considered risky by the agents and can explain ERP with low levels of risk aversion.
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Paper No.	31 (Empirical)
Journal Ranking	4*
Citation	
Title	Predicting the Equity Premium with Dividen Ratios
Author	Goyal A and Welch, I.
Journal	Management Science
Year, Vol. (No.) pp.	2003, 49(5), 639-654
Keywords	equity premium, dividend ratio, macroeconomic factors
Study Background	
Research Question	Why does dividend ratio has poor predictive ability for ERP, despite theoretical reasons?
Data Description	Annual US Data
Time Period	1926-2002
Methodology	
Variables	return on value weighted CRSP stock market index, 3-month T-bills, dividend/price ratio, dividend Yield, dividend growth rate (log of change in dividends)
Model(s) used	Regression Modelling
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	NA
Empirical	1) Neither Dividend Yield, nor Dividend Price ratio show statistically or economic predictive power for ERP
	2) Whatever small predictive power was left because of the reliably good performance of these two ratios in predicting the ERP was in the years 1973 and 1974

Paper No.	32 (Empirical)
Journal Ranking	4*
Citation	
Title	Stochastic Inflation and the Equity Premium
Author	Labadie P
Journal	Journal of Monetary Economics
Year, Vol. (No.) pp.	1989, 24(2), 277-298
Keywords	equity premium, macroeconomic factors, inflation
Study Background	
Research Question	Are the effects of stochastic inflation quantitatively important?
Data Description	Annual US Data
Time Period	
Methodology	

Variables	Same as Mehra and Prescott (1985)
Model(s) used	power utility maximisation, cash-in-advance constraint
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	There are two channels through which stochastic inflation affects ERP
	1) Stochastic Inflation affects ERP through covariance of MRS with equity price and covariance of MRS with appreciation of purchasing power of money
	2) Stochastic inflation affects ERP through inflation risk premium.
Empirical	1) When the SD of inflation and endowment growth is increased from their estimated values of (4.47%, 3.45%) to (6.32%, 5.48%), the ERP increase from 2.23% to 5.76%

Paper No.	33 (Empirical)
Journal Ranking	No Ranking
Citation	
Title	Equity Risk Premia and Pricing of Foreign exchange Risk
Author	Korajczyk R and Viallet C.
Journal	Journal of International Economics
Year, Vol. (No.) pp.	1992, 33(3-4), 199-219
Keywords	equity premium, foreign exchange risk, macroeconomic factors, international ERP
Study Background	
Research Question	Whether the observed risk premium in the forward exchange market can be explained by ERP in the international market?
Data Description	monthly data
Time Period	January 1974 to December 1988
Methodology	
Variables	spot and forward exchange rates (GBP/USD, Canadian dollar/USD, Dutch Guilder/USD, Frank/USD, Italian Lira/USD and Yen/USD), Eurocurrency rates, equity returns and inflation. US 3-Month T-bills (to compute ERP)
Model(s) used	Arbitrage Pricing Theory, representative agent's intertemporal optimisation problem to motivate asset pricing. A linkage between this pricing and factor model is discussed. Principal Component Analysis to construct factor mimicking portfolios from the returns of common stocks.
Economy	Japan, France, Italy, The Netherlands, West Germany, Switzerland, UK, Canada and USA. (developed)
Contribution and Synthesis	
Theoretical	1) If the variations in the agent's intertemporal marginal rate of substitution then the time variation in forward exchange rate premia can be explained by the time variation in the ERP in the international markets.
	2) ERP and forward exchange rate premium are related to each other.
Empirical	

Paper No.	34 (Empirical)	
Journal Ranking	4*	
Citation		
Title	Global Financial Markets and the Risk Premium in US Equity.	
Author	Chan K, Karolyi G, Stulz R.	
Journal	Journal of Financial Economics	
Year, Vol. (No.) pp.	1992,32(2), 137-167	
Keywords	international ERP, globalisation and ERP	
Study Background		
Research Question	What Drives the risk premium on US equities? Authors empirically investigate the influence of foreign capital markets on US ERP.	
Data Description	daily excess returns	
Time Period	January 1978 to December 1989	
Methodology		
Variables	Three non-US indices: Returns on Nikkei 225 index, MSCI Japan index (yen denominated), MSCI EAFE (USD denominated), 3-months US T-Bills for US ERP, 3-months Gensaki interest rate for Japanese ERP	
Model(s) used	Bivariate, GARCH-in-mean process.	
Economy	US and Japan (developed)	
Contribution and Synthesis		
Theoretical		
Empirical	1) The conditional expected ERP on US market is significantly related to conditionally expected covariance of S&P 500 with Nikkei 225, not significantly related to the conditional expected variance of S&P 500	
	2) The above result is also shown using MSCI EAFE index and MSCI Japan Index, although the result is weaker.	
	3) At 10% significance, the two factor model implying that US and Japanese Stock Markets risks are priced identically when Nikkei or EAFE indices are used .	
	4) The coefficient of covariance is significant at 10% level for MSCI Japan index and not significant for EAFE index.	
	5) The estimates of coefficient of RRA is in the range of 9.6 to 18.1 depending upon foreign portfolio	
	6) The international effect on US ERP is also significant at different frequencies of measurements of ERPs for both US and the Japanese Markets.	

Paper No.	35 (Empirical)
Journal Ranking	3*
Citation	
Title	Sources of Risk and Expected Returns in Global Equity Markets.
Author	Freson W and Harvey C
Journal	Journal of Banking and Finance
Year, Vol. (No.) pp.	1994, 18(2), 775-803
Keywords	equity premium, global equity premium, macroeconomic factors, international ERP

Study Background	
Research Question	What are the sources of risk and average returns in international equity markets?
Data Description	monthly excess returns
Time Period	1970-1989
Methodology	
Variables	returns on MSCI World Equity Index, trade-weighted USD exchange rates return on G 10 countries (G7+3), 90-days Euro dollar yield and 90-days US T-bills rate (for TED spread), global inflation (weighted average of CPI in G7 countries with GDP as weights), real interest rates (weighted average of short-term interest rates in G& countries, using GDP as weights and subtracting G7 inflation), industrial production one month US T-bills (for US ERP), average monthly change in Oil prices, weighted average of industrial production growth rates using relative production shares as the weights.
Model(s) used	Factor model regression for 18 equity markets indices, Generalised Method of Moments to estimate the model.
Economy	18 equity markets (16 OECD countries Singapore/Malaysia and Hong Kong)
Contribution and Synthesis	
Theoretical	
Empirical	1) Global risk factors can explain between 15% -86% variance in the monthly ex-post returns.
	2) World market portfolio is the largest influencing factor. It explains 16% -71% of the variance in the monthly returns of the equities depending on the country
	3) Significant association of average returns premiums with world equity index and exchange rate fluctuations but no significant association with other variables.
	4) Factor regression of excess return on 8 different risk factors shows that hypothesis, that the regression coefficients are zero is not rejected for TED spreads, G& unanticipated inflation, G7 industrial production, short term real interest rate.
	5) When USD depreciates the dollar excess return of foreign stocks tends to rise.
	6) When the number of risk factors included in the model increase then much of the abnormal average performance of the Japanese and Hong Kong stock markets maybe explained as a compensation for global economic risk.

Paper No.	36 (Empirical)
Journal Ranking	3*
Citation	
Title	Is the correlation in international equity returns constant: 1960-1990?
Author	Longin F and Slonik B.
Journal	Journal of International Money and Finance
Year, Vol. (No.) pp.	1995, 14(1), 3-26
Keywords	international equity premium, globalisation, equity premium, excess return
Study Background	
Research Question	Is the conditional correlation of excess returns constant over time in the international equity markets?
Data Description	monthly returns
Time Period	1960-1990
Methodology	

Variables	excess stock returns, dividend yield, long and short term interest rates (YTM of government bonds with maturity ranging from 5-15 years), euro-currency rates as risk-free rates.
Model(s) used	GARCH (1,1) to study the evolution of conditional correlation structure of excess returns. Jenrich's test of equality of two matrices of correlation.
Economy	7 developed stock markets. (France, Switzerland, Germany, UK, Canada, US and Japan)
Contribution and Synthesis	
Theoretical	
Empirical	1) International correlation and covariances of monthly excess returns are unstable over time.
	2) GARCH (1,1) model for conditional correlations of equity premium indicates an increase in the correlation in the international equity markets over the sample period.
	3) Correlations rise when conditional volatility is large.
	4) Dividend yields and interest rates contain information about future volatility and the correlations of equity premium across the market.

Paper No.	37 (Empirical)
Journal Ranking	No Ranking
Citation	
Title	Do Macroeconomic Factors Help in Predicting International Risk Premia? Testing the Out-of-Sample accuracy of Linear and Non-Linear Forecast.
Author	Dropsy, V.
Journal	Journal of Applied Business Research
Year, Vol. (No.) pp.	1996, 12 (3), 120-132
Keywords	international equity premium, globalisation, equity premium, excess return
Study Background	
Research Question	1) To measure the ex-ante predictability of ERP in four major stock exchanges conditioned on macroeconomic variables.
	2) To test out-of-sample predictive ability of non-linear neural networks relative to linear regressions and the random walk model.
Data Description	monthly data
Time Period	1971-1990
Methodology	
Variables	ERP (MSCI index return minus the 3-months T-bills for respective countries), government spending to GDP ratio, M2 money supply growth rate, short term interest rates (3 months T-bills for UK and US, money market rates for Germany and Japan), spread between ten year government bond yield and short term interest rate, CPI measure for inflation, ratio of trade balance to GDP, nominal effective rate of depreciation of domestic currency against the foreign currency, real oil price inflation rate. In total 7 macroeconomic variables were used as explanatory variables
Model(s) used	recursive linear regressions, random walk model and non-linear neural network model (to test the out-of-sample predictive ability)
Economy	US, Japan, UK and Germany (Developed)
Contribution and Synthesis	

Theoretical	NA
Empirical	1) The RMSE and MAE from linear regressions and neural network model is almost always 30% and 20% respectively smaller than the respective values for the random walk model.
	2) Linear Forecast outperforms the non-linear forecast in terms of RMSE and MAE.
	3) Out-of-sample forecasts of equity premium, using the explanatory variables, produced by linear and non-linear models (neural network) are superior than produced by random walk

Paper No.	38 (Empirical)
Journal Ranking	4*
Citation	
Title	Characterizing the Predictable Components in Excess Returns on Equity and Foreign Exchange Markets
Author	Bekaert G and Hodrick R.
Journal	The Journal of Finance
Year, Vol. (No.) pp.	1992, 47(2), 467-509
Keywords	Cross Reference
Study Background	
Research Question	Whether the predictability of equity premium and forward exchange rate premium using state variables is an evidence of market inefficiency or time-varying risk premiums in an efficient market?
	To Characterise the predictable components of excess returns in the 4 major stock exchanges
Data Description	monthly data
Time Period	1981-1989
Methodology	
Variables	dividend yields, forward premiums and lagged excess returns as predictors of ERP
Model(s) used	Vector Autoregression
Economy	US, Japan, UK and Germany (Developed)
Contribution and Synthesis	
Theoretical	NA
Empirical	1) Variables such as dividend yields and forward premium are shown to have predictive power for excess returns in equities and foreign exchange markets.
	2) A 1% change in the dividend yields in the long horizon leads to 2-4% increase in the expected returns over following forty-eight months.
	3) Increases in the forward premium forecast lower expected excess equity returns in all the four countries
	4) The volatility bounds on agent's IMRS are considerably more when the US investments are jointly analysed with foreign markets, than when restricted only to the US excess returns.

Paper No.	39 (Empirical)
Journal Ranking	4*
Citation	
Title	The Declining Equity Premium: What Role does Macroeconomic Risk Play?
Author	Lettau, M., Ludvigson, S. and Wachter, J.
Journal	The Review of Financial Studies
Year, Vol. (No.) pp.	2008, 21(4), 1653-1687
Keywords	equity premium, time varying
Study Background	
Research Question	What is the impact of frequency macroeconomic fluctuations on asset equity returns?
Data Description	Quarterly data
Time Period	1952-2002
Methodology	
Variables	GDP, aggregate personal consumption expenditure, price-deflator, Price/Dividend Ratio, return on CRSP value-weighted index
Model(s) used	Two-state Markov regime switching model, Epstein-Zin-Weil preferences utility model.
Economy	US (developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) There is a strong correlation between low-frequency movements in macroeconomic volatility and asset prices
	2) Equity Premium has been declining since the 1990s as the volatility of consumption growth rate and other macroeconomic variables have decreased.
	3) The decrease in the consumption risk is persistent.
	4) The high mean state of consumption is expected to last for 33 quarters on average and the low volatility state is expected to last for 125 quarters.

Paper No.	40 (Empirical)
Journal Ranking	4*
Citation	
Title	Nonlinearities in the Relation Between the Equity Risk Premium and the Term Structure
Author	Boudoukh J., Rishardson M. and Whitelaw R.
Journal	Management Science
Year, Vol. (No.) pp.	1997, 43(3), 371-385
Keywords	equity premium
Study Background	
Research Question	Is there any relation between the conditional expected ERP and the slope of the Term Structure?
Data Description	Annual US Data
Time Period	1802-1990
Methodology	

Variables	yields on 1 year and 20 year government bonds,
Model(s) used	Non-linear regressions, non-parametric estimations for estimating the pricing kernel, Taylor expansion of ERP as a function of term structure spread.
Economy	US (developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) Variations in the equity premium is not related to variations in the variance of equity returns.
	2) There is statistically significant non-linear relationship between the ERP and slope of the term structure of interest rate.
	3) Changes in term structure spreads have different implications for expected ERP.
	4) When the slope of the term structure of interest rate is either small or negative, ERP is sensitive to the spread between long and short term interest rate.
	5) The magnitude and the sign of ERP depend on slope of the term structure of interest rate.
	6) The estimated relation between the term structure spread and the ERP is concave
	7) Negative or positive ERP are associated with downward or upward sloping term structure

Paper No.	41 (Empirical)
Journal Ranking	2*
Citation	
Title	A Note on the Relation Between Equity Risk Premium and the Term Structure
Author	Kanas A
Journal	Journal of Economics and Finance
Year, Vol. (No.) pp.	2010, 34(1), 89-95
Keywords	equity premium, macroeconomic factors, term structure
Study Background	
Research Question	Is there any relation between the ERP and term structure of interest rate by incorporating the regime switching volatility in the ERP?
Data Description	
Time Period	1900-2006
Methodology	
Variables	
Model(s) used	2-State (upward and downward sloping term structure) regime switching Markov model
Economy	UK, USA and Japan (Developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) There is significant asymmetric regime-dependent non-linear relationship between the term structure of interest rate and ERP
	2) When ERP is low volatility regime, an increase in slope of term structure causes an increase in the next year's expected ERP

	3) In the low volatility regime of ERP, the negative sloping term structure has no impact on ERP
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Paper No.	42 (Empirical)
Journal Ranking	4*
Citation	
Title	A Recursive Modelling Approach to Predicting UK Stock Returns
Author	Pesaran M.H. and Timmermann A.
Journal	The Economic Journal
Year, Vol. (No.) pp.	2000, 110(460), 159-191
Keywords	equity premium, macroeconomic factors, term structure
Study Background	
Research Question	(Implicit) What are the effects of macroeconomic variables on UK ERP?
Data Description	Monthly data
Time Period	1965-1993
Methodology	
Variables	Prices of FTSE All Share Index (end of month), 12-months moving average of dividends, dividend yield, yield on 2.5% government consol (taken at the end of month), 3-month T-bill rate, inflation as measured by change in RPI, annual change in industrial production, annual change in narrow money supply M0, annual change in spot oil price, ERP measured against T-bills.
Model(s) used	regression model
Economy	UK(Developed)
Contribution and Synthesis	
Theoretical	NA
Empirical	1) There is statistically significant relationship between the predictor variables and the equity premium.
	2) The lagged values of some the predictors also have impact on UK ERP.

Paper No.	43 (Empirical)
Journal Ranking	2*
Citation	
Title	The Relation Between the Equity Risk Premium and Bond Maturity Premium in the UK: 1900:2006
Author	Kanas A.
Journal	Journal of Economics and Finance
Year, Vol. (No.) pp.	2009, 33(2), 111-127
Keywords	equity premium, macroeconomic factors
Study Background	
Research Question	Is there any predictability in the relation between ERP and Bond Maturity Premium (BMP) in the UK?
Data Description	Annual data in the UK
Time Period	1900-2006

Methodology	
Variables	Geometric ERP using T-bills as risk free rate, BMP,
Model(s) used	2 State regime switching Markov process, VAR model
Economy	UK (Developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) A regime switching non-linear relationship exist between BMP and ERP.
	2) Two regimes, low volatility and high volatility, are found for both the variables
	3) In low volatility regime lagged BMP predicts ERP positively
	4) Lagged ERP predicts BMP in the low volatility regime.

Paper No.	44 (Empirical)
Journal Ranking	4*
Citation	
Title	Stock Returns and the Term Structure
Author	Campbell, J.
Journal	Journal of Financial Economics
Year, Vol. (No.) pp.	1987, 18(2), 373-399
Keywords	Cross Reference
Study Background	
Research Question	Do the variables that predict excess return in term structure also predicts the ERP?
Data Description	Monthly US data
Time Period	1959-1983
Methodology	
Variables	one-month, two-months and 6-months T bills, portfolio of 5-10 T-bonds, weighted averages returns on NYSE stocks, four excess returns are calculated by subtracting the one-month T-bills returns from the other four. The predictor variables are 1-month bill, spread of 2-months bill over 1-month, spread of 6 month bill over 1-month bill and the lag of two-month spreads over 1-month
Model(s) used	regression analysis, Generalised Method of Moment to estimate the first two moments of ERP.
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) The four information variable related to the term-structure predict equity premium over next month.
	2) The forecast able component in the excess returns of bills, bonds and stocks is present in the term structure of interest rate
	3) The fitted values of ERP regressed on the four information variables varies with SD = 17% .

Paper No.	45 (Empirical)
Journal Ranking	4*
Citation	
Title	Corporate Earnings and Equity Premium
Author	Longstaff F. and Piazzesi M.
Journal	Journal of Financial Economics
Year, Vol. (No.) pp.	2004 74(3), 401-421
Keywords	equity premium, macroeconomic factors
Study Background	
Research Question	Do highly volatile aggregate corporate dividends as small fraction of aggregate consumption affect ERP?
Data Description	annual US data
Time Period	1929-2001
Methodology	
Variables	Earnings, aggregate consumption, pay-out ratio is assumed to be 50%, annualised volatility of monthly returns on the CRSP value-weighted index.
Model(s) used	standard power utility function, jump-diffusion model
Economy	US (developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) ERP consist of three components consumption risk premium, corporate risk premium and the third is even risk premium (related to jumps in consumption and stock prices)
	2) Using the RRA of five, the three components 0.36%, 1.39% and 0.51% respectively giving rise to ERP of 2.26% implied from the model.
	3) The volatility of equilibrium returns in the model matches with the actual data.
	4) The share of corporate risk premium in total ERP is the maximum, as compared to the other two

Paper No.	46 (Empirical)
Journal Ranking	No Rank
Citation	
Title	The Equity Premium and the Inflation
Author	Beirne J and de Bondt G.
Journal	Applied Financial Economic Letters
Year, Vol. (No.) pp.	2008, 4(6), 439-442
Keywords	equity premium, macroeconomic factors, inflation
Study Background	
Research Question	Is there any link between the expected ERP, measured by using dividends and earnings, and the inflation in the major economies in the post-Bretton Woods system?
Data Description	Monthly Data
Time Period	1973-2007

Methodology	
Variables	3-month T-bills and 10 year Government Bond rate as risk free rate, composite share price index, p/e ratio, dividend yield, CPI data,
Model(s) used	Regression analysis, expected (ex-ante ERP) is calculated using Fama and French (2002) approach, in particular the earnings growth approach.
Economy	Japan, Australia, Euro Area, Germany, France, Euro area, the UK, The Netherlands Switzerland, Canada and the US. (Developed economy)
Contribution and Synthesis	
Theoretical	
Empirical	1) The level of ERP depends on inflation
	2) Regression analysis show that ERP has adjusted to the inflation by factor of two-third in the post Bretton Woods era.
	3) The average ERP for all the countries using short-term bills rate as risk free, is 2% and using long term government bonds as risk free, is 0.8%
	4) The ERP has been decreasing over the sample period, however only until 2000s, where the ERP is increasing except for the UK.
	5) The impact of inflation has been decreasing since the 1990s whereas prior to the 1990s, inflation had major impact.
	6) The low levels of inflation is the key in explaining the low levels of ERP in the recent years

Paper No.	47 (Empirical)
Journal Ranking	3*
Citation	
Title	Model Specification, the Equilibrium Natural Interest Rate and the Equity Premium
Author	Tristani, O
Journal	Journal of Money, Credit and Banking
Year, Vol. (No.) pp.	2009, 41(7), 1453-1479
Keywords	equity premium, macroeconomic factors, inflation
Study Background	
Research Question	How different degrees of uncertainty over trend productivity growth and trend money growth affect the natural interest rate and the equity premium?
Data Description	quarterly data
Time Period	1959-1998
Methodology	
Variables	consumption data, CPI, money supply M2,
Model(s) used	Lucas (1978) model, continuous time monetary model of Stulz (1986)
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	1) The natural (risk-free) interest rate and the equity premium can be significantly affected by uncertainty over the future course of monetary policy (i.e., trend money growth)
Empirical	1) going from very low to extremely high monetary uncertainty leads, ceteris paribus, to a fall by between 10 and 20 basis points in the natural rate and to a jump from 0% to 1.3% in the difference between natural rate and the ex-ante real rate.

	2) At the same time, this increase in monetary uncertainty is accompanied by a 1.7% increase in the equity premium.
	3) Agent's confidence about the monetary policy model followed by the central banks help in shaping the equity premium.

Paper No.	48 (Empirical)
Journal Ranking	4*
Citation	
Title	The Equity Premium implied by Production
Author	Jermann, U.
Journal	Journal of Financial Economics
Year, Vol. (No.) pp.	2010
Keywords	equity premium, macroeconomic factors
Study Background	
Research Question	1) What properties of investment and production technologies are important for the first and second moments of risk free rates and aggregate equity returns?
	2) Does a model plausibly calibrated to the US economy have the ability to replicate the first and second moments of risk free rates and aggregate equity returns?
Data Description	Annual US data
Time Period	1947-2003
Methodology	
Variables	indexes of investment for equipment and software, deflator of non-durable consumption, deflator of investment good, depreciation for equipment and software, capital stock ratio, data from Campbell and Cochrane (1999)
Model(s) used	Multi-input aggregate production technology, Q-theory of investment, capital adjustment cost and stochastic productivity.
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) The model can match, unconditional first and second moments of market return and risk free rates with reasonable parameter value
	2) For conditional moments, the expected excess stock returns, the market's Sharp ratio, and the market price of risk are very volatile.

Paper No.	49 (Empirical)
Journal Ranking	4*
Citation	
Title	Out-of-Sample Equity Premium Prediction: Combination Forecasts and Links to the Real Economy
Author	Rapach, D., Strauss J. and Zhou, G.
Journal	The Review of Financial Studies
Year, Vol. (No.) pp.	2010, 23 (2), 821-862
Keywords	equity premium, macroeconomic factors
Study Background	

Research Question	Can we produce accurate out-of-sample forecasts for ERP by combining the individual forecasts of ERP produced by individual predictor economic variables?
Data Description	Quarterly Data from the US
Time Period	1947-2005
Methodology	
Variables	Dividend/price ratio, Dividend Yield, Earnings/Price ratio, Log of dividend pay-out ratio, Stock variance, book/market ratio, net equity expansion, T-bills rate, long term yield, long term return, Term spread, default yield spread, default return spread, inflation (CPI) and investment/capital ratio.
Model(s) used	15 different regression models for 15 variables as used in Welch and Goyal (2008), combining the individual forecast from 15 regression models,
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	1) Individual regression models for forecasting ERP using economic variables produces less accurate forecast and are too volatile than that produced by combining individual forecasts as it reduces the variance of the forecast quite substantially.
Empirical	1) By combining the forecasts produced by 15 regression models using 15 economic variables as predictors of ERP, out-of-sample prediction of ERP is possible and the variables do predict ERP
	2) Combination forecasts of ERP are linked to real economy.
	3) The 15 economic variables that generate the combination forecasts of ERP also produce out-of-sample ERP forecast when combining them with macroeconomic variables such as real GDP growth, real earnings growth and net cash flow growth.
	4) Structural breaks in the macro-economy are frequently linked to the significant breaks in the ERP predicative regression models.

Paper No.	50 (Empirical)
Journal Ranking	No Ranking
Citation	
Title	Dividends, Momentum and Macroeconomic Variables as Determinants of US Equity Premium across Economic Regimes
Author	Bhar R and Malliaris A
Journal	Review of Behavioral Finance
Year, Vol. (No.) pp.	2011. 3(1), 27-53
Keywords	equity premium, macroeconomic factors
Study Background	
Research Question	Can macroeconomic, fundamental and Behavioral variables predict ERP in a regime dependent system?
Data Description	monthly data
Time Period	1965-2008
Methodology	
Variables	Macroeconomic variables- CPI inflation, 3-mnthd T bills (Risk free rate), unemployment rate, returns on S&P 500, dividend yield (fundamental variable) and momentum return (Behavioral variable).
Model(s) used	3-State Markov regime switching

Economy	US (Developed)
Contribution and Synthesis	
Theoretical	NA
Empirical	1) When economic regimes are divided according to the level of volatility of the equity premium the time duration of low volatility will be longer than the duration of the medium-volatility regime, and both will be longer than the duration of the highest-volatility regime.
	2) The average durations for high-volatility medium-volatility and low-volatility regimes are 4.63, 20.08, and 40.74 months, respectively.
	3) dividends are very important as an explanatory variable and are expected to be significant across all regimes with a negative coefficient as high dividends reduce net returns
	4) During periods of economic stability with low volatility, macroeconomic variables such as inflation and unemployment to play a significant role in explaining the equity premium. This hypothesis is partially confirmed because the significance of macroeconomic variables changes across the three volatility regimes.
	5) Momentum is present across the three regimes and higher momentum contributes to higher returns.
	6) During periods of high volatility, momentum becomes the most significant variable among the ones considered in this model.
	7) During periods of very low volatility for the equity premium, dividends initially drive returns, but momentum also becomes important. Similarly in periods of very high volatility, both dividends and momentum explain returns but the significance of momentum increases.
	8) Momentum, dividends, and unemployment are significant explanatory variables for the equity premium both in the low-volatility and high-volatility regimes, but the significance of momentum does not increase during the high-volatility regime as hypothesized.

Paper No.	51 (Empirical)
Journal Ranking	4*
Citation	
Title	Predicting Excess Stock Returns out-of-Sample: Can Anything Beat the Historical Average?
Author	Campbell, J and Thompson S.
Journal	The Review of Financial Studies
Year, Vol. (No.) pp.	2008, 21(4), 1509-1531
Keywords	equity premium, macroeconomic factors
Study Background	
Research Question	Whether standard variables could have been used in real time to forecast twentieth - and early twenty-first century stock returns?
Data Description	Monthly Data
Time Period	1927-2005
Methodology	

Variables	Dividend/price ratio, earnings/price ratio, smoothed earning/price ratio, Book/Market ratio, Return on equity, 3-T bills rate, long term yield, term-spread, default spread, inflation, net equity issuance, consumption-wealth ratio.
Model(s) used	Restricted and un-restricted regression analysis of in-sample and out-of-sample data.
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	
Empirical	1) Most of the predictor variables predicts the equity premium better than the historical average return forecasts, once restrictions are imposed on the sign of the coefficients of forecast and return forecasts.
	2) The out-of-sample predictive power of these variables is small however it is economically significant.
	3) Theoretically restricted valuations models often outperform the historical returns forecasts .i.e. ERP predicted by the theoretically restricted models perform better than the forecast of ERP based on average historical value.

Paper No.	52 (Empirical)
Journal Ranking	3*
Citation	
Title	Viewpoint: Estimating the Equity Premium
Author	Campbell, J
Journal	Canadian Journal of Economics
Year, Vol. (No.) pp.	2008, 41(1), 1-21
Keywords	equity premium, estimating, estimation
Study Background	
Research Question	How to estimate equity premium using valuation ratios?
Data Description	Annual data
Time Period	1982-2007
Methodology	
Variables	dividend pay-out ratio, earnings/price ratio, real profitability and the yield on inflation-indexed bonds in the US, Canada
Model(s) used	earnings growth model to estimate ERP
Economy	US, Canada, World (MSCI World Index)
Contribution and Synthesis	
Theoretical	NA
Empirical	1) Implied ERP assuming constant profitability (ROE) and pay-out ratio is 3.3% for the MSCI World index, 3.2% for the US and 3.1% for Canada.
	How to estimate equity premium using valuation ratios?

Paper No.	53 (Empirical)
Journal Ranking	4*
Citation	
Title	A Monetary Explanation of the Equity Premium, Term Premium and the Risk Free Rate Puzzles
Author	Bansal, R. and Cloeman W J.
Journal	Journal of Political Economy
Year, Vol. (No.) pp.	1996, 104(6), 1135-1171
Keywords	equity premium, equity premium puzzle, explanation
Study Background	
Research Question	Can return on transaction services explain the asset pricing puzzles?
Data Description	monthly data
Time Period	January 1959- June 1991
Methodology	
Variables	consumption of services and non-durables, currency in circulation, quantity of risk-free assets equals net currency in circulation, (M3+non-bank public holdings of US savings bonds, short-term bills less than 12 months, commercial papers and bankers acceptance), value weighted returns on NYSE stocks and holding period returns on bonds with 1 and 6 months left to maturity.
Model(s) used	Transaction cost model, the parameters of the model are estimated using GMM.
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	1) By considering the transaction service return on certain liquid assets, the rate return on these liquid assets turn out to be very low and so when these are used as risk-free assets to estimate ERP, we get higher estimates of ERP with similar preferences as used by Mehra and Prescott (1985)
Empirical	1) the estimated RRA and subjective discount factor is 1.49 and 0.998 (they are in reasonable range)
	2) 1.4% of the overall endowment is lost due to overall transaction cost.
	3) In the actual data the ex-post real interest rate is 1.12% whereas in the estimated model it is 4%. The actual ERP is 5.02% and the ERP estimated by the model is 2.42%.

Paper No.	54 (Empirical)
Journal Ranking	2*
Citation	
Title	The Equity Premium and the Business Cycle: The Role of Demand and Supply Shocks
Author	Smith, P., Sorensen S. and Wickens M.
Journal	International Journal of Finance and Economics
Year, Vol. (No.) pp.	2010, 15(2), 134-152
Keywords	equity premium, macroeconomic variables
Study Background	
Research Question	How should we analyse the effect of business cycle on the stock market in a no-arbitrage framework?

Data Description	monthly data
Time Period	1960-2003
Methodology	
Variables	log of first difference of industrial production, log of CPI inflation, log of first difference of money growth M1, log return on value weighted stocks on NYSE, NASDAQ and AMEX, 1-month T-bills rate (risk-free rate),
Model(s) used	Multi-variate GARCH-in-mean
Economy	US(Developed)
Contribution and Synthesis	
Theoretical	1) Demand shocks have different impact on ERP than supply shocks
Empirical	1) In recessions, the negative supply shock is the important source for increase in the ERP.
	2) Aggregate demand shock appears to be less important in explaining the variations on the ERP.
	3) in increase in the variance of the output growth suggests that there will be increase in the variance of ERP in the following period.
	4) The conditional correlation between ERP and inflation is negative unlike correlations with output and money growth.

Paper No.	55 (Empirical)
Journal Ranking	0
Citation	
Title	Assessing the Relation Between Equity Risk Premium and Macroeconomic Volatilities in the UK
Author	Kizys R and Spences P.
Journal	Quantitative and Qualitative Analysis on Social Sciences
Year, Vol. (No.) pp.	2008, 2(1), 50-77
Keywords	equity premium, macroeconomic variables
Study Background	
Research Question	1) whether macroeconomic volatilities significantly correlate with changes in inflationary expectations, proxied by the long-term government bond yield
	2) whether the UK equity market investors significantly price in these macroeconomic volatilities
Data Description	Monthly
Time Period	1964-2004
Methodology	
Variables	Return on FTSE All Share Index, yields on UK consol, industrial production, 3-months T-bills and RPI inflation.
Model(s) used	Tri-variate Exponential GARCH-in-mean model, stochastic discount factor approach.
Economy	UK (developed)
Contribution and Synthesis	
Theoretical	NA
Empirical	1) The covariance between the output growth and equity returns has significant effect on ERP although that between inflation and equity return does not.

	2) We find that the UK equity risk premium reflects the rise and subsequent fall in macroeconomic volatility
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Paper No.	56 (Empirical)
Journal Ranking	4*
Citation	
Title	Average Debt and Equity Returns: Puzzling?
Author	McGrattan E and Prescott E.
Journal	The American Economic Review
Year, Vol. (No.) pp.	2003, 93(2), 392-397
Keywords	Cross Reference
Study Background	
Research Question	Are average equity and debt returns, and thus ERP, puzzling, after taking into accounted the taxes and holding costs?
Data Description	Annual
Time Period	1880-2002
Methodology	
Variables	Average marginal tax rate on dividend income, mutual fund costs, CPI inflation, yields on long-term, high-grade municipal bonds,
Model(s) used	NA
Economy	US (developed)
Contribution and Synthesis	
Theoretical	The ERP is modest as predicted by the standard growth model used in macroeconomics to study growth and fluctuations.
Empirical	1) If capital-gains taxes, brokerage costs, and possibly higher pre- 1980 diversification costs are ignored, an upper bound for the average equity return is 5.4 per cent for 1880-2002.
	2) The average equity return for the period before 1980 is 5.1 per cent, which is about 1 % above the average return to NIPA capital
	3) During the gold-standard period, savers in long-term debt assets realized relatively high return: close to 4 % and The average for 1960-2002 is 3.72%
	4) The average real returns after adjusting for taxes and diversification costs, are not puzzling.

Paper No.	57 (Conceptual)
Journal Ranking	4*
Citation	
Title	The Higher Equity Risk Premium Created by Taxation
Author	Leibowitz M
Journal	Financial Analysts Journal
Year, Vol. (No.) pp.	2003, 59(5), 28-31
Keywords	Cross Reference

Study Background	
Research Question	Does favourable taxation generate higher ERP?
Data Description	NA
Time Period	NA
Methodology	
Variables	NA
Model(s) used	NA
Economy	NA
Contribution and Synthesis	
Theoretical	1) Different tax rate applied to income from fixed investment security and income from equity causes higher ERP
	2) The favourable tax structure for equities projects tax shield on the fixed income investment which forms the theoretical foundation for ERP
	3) The after tax compensation (ERP) per unit of volatility of equity is higher than its tax-free counterpart.
	4) The after tax ERP remains unaffected by inflation.
Empirical	NA

Paper No.	58 (Empirical)
Journal Ranking	4*
Citation	
Title	Asset Returns with Transaction Costs and Uninsured Individual Risk.
Author	Aiyagari S.R. and Gertler M.
Journal	Journal of Monetary Economics
Year, Vol. (No.) pp.	1991, 27 (3), 311-331
Keywords	Heterogeneous Agents, equity premium
Study Background	
Research Question	Whether an economy with transaction costs and heterogeneous labour income warrants high ERP?
Data Description	Simulations based study. Data is taken for literature not from any data source.
Time Period	1949-1978
Methodology	
Variables	return on S&P 500, 3-month T bills, average of the ratio of household ownership of tradable equity with national income, household liquid assets to national income
Model(s) used	3-state Markov chain process for labour income.
Economy	US (developed)
Contribution and Synthesis	
Theoretical	1) The existence of trading costs for stocks in conjunction with the need to trade securities to smooth out consumption can lead to ERP
	2) The incompleteness of the market implies low risk free rate
	3) Transaction cost for trading risk-free assets is less than that for equities.
Empirical	Realistic Transaction costs might account for about 50% of the observed ERP.

Paper No.	59 (Empirical)
Journal Ranking	4*
Citation	
Title	Evaluating the Effects of Incomplete Markets on Risk Sharing and Asset Pricing
Author	Heaton J and Lucas D
Journal	Journal of Political Economy
Year, Vol. (No.) pp.	1996, 104(3), 443-487
Keywords	Heterogeneous Agents, equity premium, incomplete markets
Study Background	
Research Question	
Data Description	annual US data
Time Period	1969-1984
Methodology	
Variables	aggregate income and dividends from NIPS (1947-1992) individual income (family income per family member) the data is from PSID
Model(s) used	the effect of transaction costs in and economy with both aggregate and idiosyncratic shocks, quadratic transaction cost function
Economy	US (developed)
Contribution and Synthesis	
Theoretical	1) Transaction costs have two effects on Asset Prices, the direct effect due to transactions and the indirect effect which arises because agents don't want to transact to smooth the consumption
Empirical	1) With a binding borrowing constraint or a large wedge between borrowing and lending rates, a transaction costs in the stock market can produce ERP half of the observed value.
	2) 20% of ERP is attributed to the indirect effect while the remaining to the direct effect.
	3) Transaction costs in stock and bond market generate ERP and lower risk-free rate.
	4) By simultaneously considering aggregate and idiosyncratic shocks, the effect of transaction cost on ERP can be decomposed into two effects, Direct and Indirect effects.

Paper No.	60 (Empirical)
Journal Ranking	4*
Citation	
Title	The Consumption of Stockholders and Non-Stockholders
Author	Mankiw G and Zeldes S.
Journal	Journal of Financial Economics
Year, Vol. (No.) pp.	1991, 29(1), 97-112
Keywords	Heterogeneous Agents, equity premium
Study Background	

Research Question	Is the consumption of stockholders differs from the consumption of non-stockholders and can this be used to explain the ERP?
Data Description	
Time Period	1970-1984
Methodology	
Variables	food consumption of stockholders and non-stockholders, Return on S&P 500, 3-months T-bills rate, consumption growth from PSID
Model(s) used	
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	1) The evidence indicates that stockholders and non-stockholders differ substantially.
	2) Stockholders' consumption is more volatile and more highly correlated with the stock market.
	3) distinction between stockholders and non-stockholders may be crucial to an ultimate resolution of the ERP puzzle and other asset pricing anomalies
Empirical	1) data show that stockholding families spend approximately 25% more per capita on food than non-stockholding families and that approximately 75% of stockholders' food expenditures and 17% of non-stockholders' food expenditures occur away from home.

Paper No.	61 (Empirical)
Journal Ranking	4*
research Question	
Title	Asset Pricing with Heterogeneous Consumers and Limited Participation: Empirical Evidence.
Author	Brav A., Constantinides G. and Geczy C.
Journal	Journal of Political Economy
Year, Vol. (No.) pp.	2002, 110(4) 793-824
Keywords	Heterogeneous Agents, equity premium, incomplete markets
Study Background	
Research Question	What are the implications of relaxing the assumption of complete consumption insurance on asset pricing?
Data Description	
Time Period	1982-1996
Methodology	
Variables	consumption of non-durables and services, CPI, 1-month T-bills rate as risk free, monthly returns on stocks on NYSE, RRA is chosen in the range of 0-9
Model(s) used	Taylor expansion SDF, power utility function, GMM to estimate RRA
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	1) The model is better able to explain the ERP with low RRA.

	There is an evidence that SDF driven by per capita consumption growth can explain the ERP with high value of RRA once the fact that only a subset of households are marginal in the stock market is recognise.
	Limited Participation of households in a representative consumer model explains ERP with lower value of RRA
Empirical	1) Equally weighted sum of household's MRS is a valid SDF with RRA 3

Paper No.	62 (Conceptual)
Journal Ranking	4*
Research Question	
Title	Asset Pricing with Heterogeneous Consumers
Author	Constantinides G. and Duffie D.
Journal	Journal of Political Economy
Year, Vol. (No.) pp.	1996, 104(2), 219-240
Keywords	Heterogeneous Agents, equity premium,
Study Background	
Research Question	What are the implications of incomplete consumption insurance and heterogeneous consumers on asset pricing under representative agent-based model?
Data Description	NA
Time Period	NA
Methodology	
Variables	NA
Model(s) used	pure exchange economy with single consumption good
Economy	NA
Contribution and Synthesis	
Theoretical	1) The authors demonstrate the joint hypothesis of incomplete consumption insurance and consumer heterogeneity enriches the pricing implications of representative consumer model even without introducing borrowing constraints, short-sale restrictions, borrowing costs, transaction costs.
	2) There exists an individual income process, consistent with the aggregate income process, such that the equilibrium security and bond price match the given security and bond price process.
	3) The model provides a testable hypothesis that the source of equity premium is the covariance of the security's returns with cross-sectional variance of individual consumption growth process.
Empirical	NA

Paper No.	63 (Empirical)
Journal Ranking	4*
research Question	
Title	Junior Can't Borrow: A New Perspective on the Equity Premium Puzzle

Author	Constantinides G., Donaldson J. and Mehra R.
Journal	The Quarterly Journal of Economics
Year, Vol. (No.) pp.	2002, 117(1), 269-296
Keywords	Heterogeneous Agents, equity premium, equity premium puzzle, incomplete markets
Study Background	
Research Question	What happens to asset pricing models and ERP when the life cycle aspect is introduced?
Data Description	Annual
Time Period	1889-1999
Methodology	
Variables	mean and SD of 20 year real return on S&P 500, government bonds, consols, consumption of young, middle aged and old, average share on income going to labour, average share of income going to interest on government bond, coefficient of variation of 20-year wage income of middle-aged, coefficient of variation of 20-year aggregate income and 20-year autocorrelation and cross correlation of labour income of middle aged and aggregate income.
Model(s) used	Overlapping generation exchange economy model.
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	1) Imposition of borrowing constraints reduces the risk-free rate and increases the ERP.
Empirical	2) Young consumer would like to borrow and invest in the equity because their future consumption has low correlation with equity return. However borrowing constraints prevent them from doing so.
	3) Therefore the young cannot participate in the stock market and hence equities almost priced by the middle aged.

Paper No.	64 (Empirical)
Journal Ranking	4*
Research Question	
Title	The Equity Premium: A Puzzle
Author	Mehra R. and Prescott E.
Journal	Journal of Monetary Economics
Year, Vol. (No.) pp.	1985, 15(2), 145-161
Keywords	equity premium, puzzle
Study Background	
Research Question	What happens to asset pricing models and ERP when the life cycle aspect is introduced?
Data Description	Annual
Time Period	1889-1978
Methodology	
Variables	per capita real consumption, return on S&P composite Stock Price Index, real annual dividends, nominal yields on short term risk free securities (3-month T-bills rate, 90-day Prime Commercial Paper rates)

Model(s) used	Lucas (1978) pure exchange economic model, expected utility hypothesis, CCPAM, Markov chain for dividend growth process
Economy	US (Developed)
Contribution and Synthesis	
Theoretical	Standard Economic Theory of CCPAM, Utility Theory and Euler's equation fails to match the observed ERP in the US at relatively reasonable values of RRA.
Empirical	1) The actual ERP in the US for the sample period was 6.18% whereas that predicted by the model was 0.35% maximum.
	2) RRA of 26 is needed in the model to generate ERP of 6.18%, which is completely implausible based on standard economic theory